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WAR MACHINE

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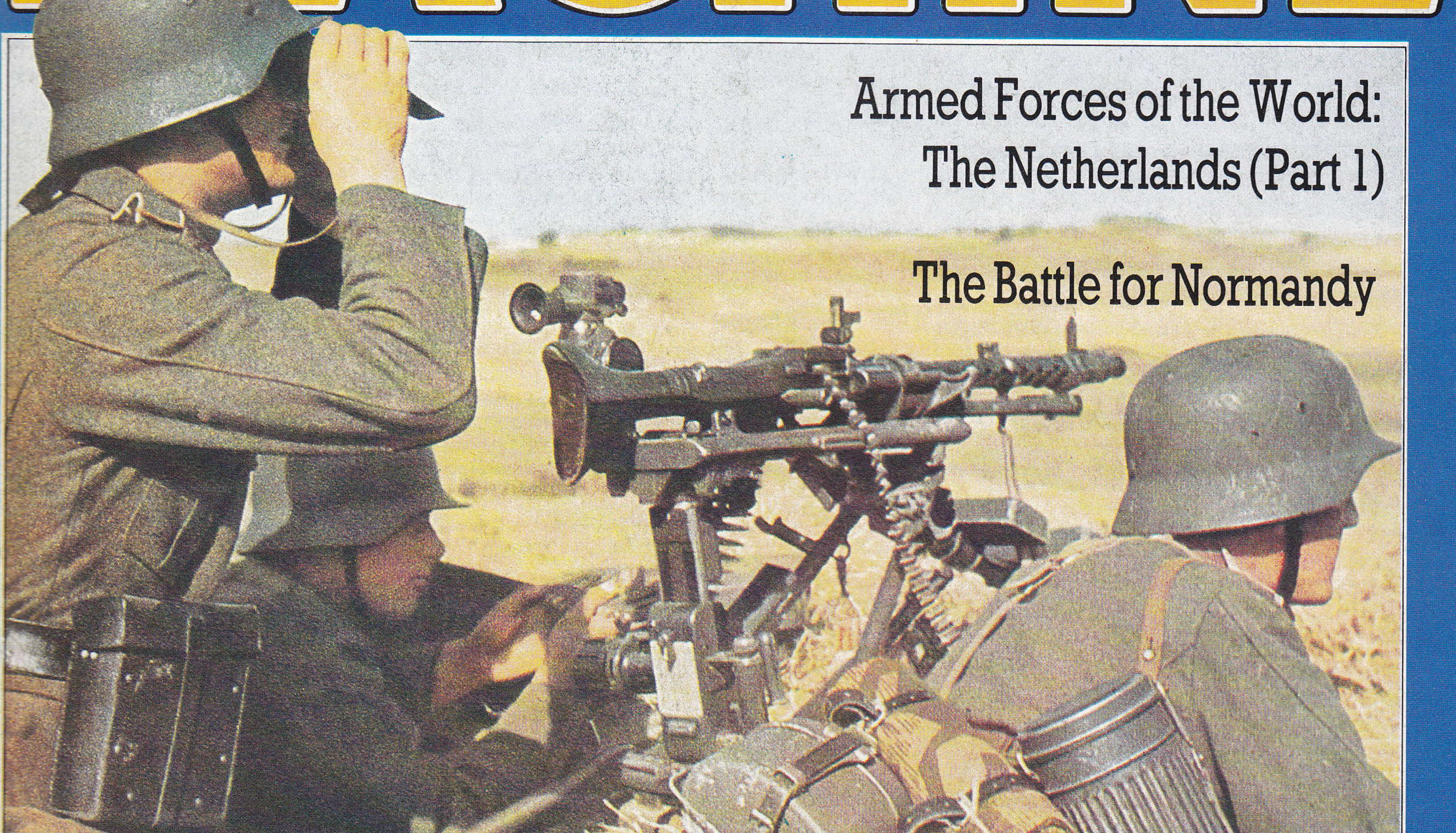

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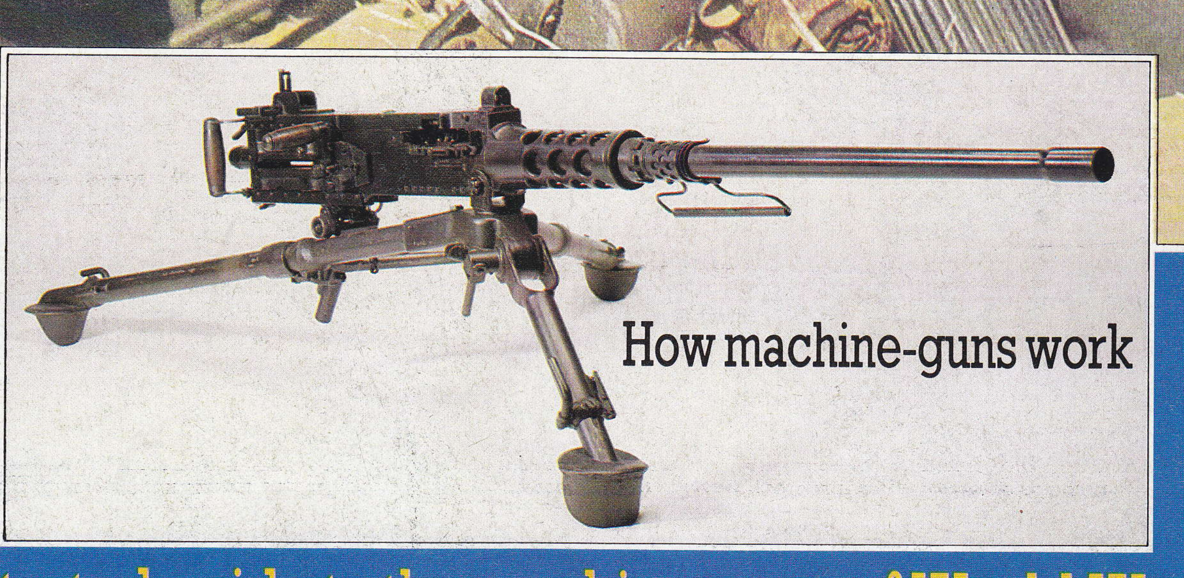

How machine-guns work

The Battle of Stalingrad

The MG 42 in Action

A fully illustrated guide to the machine-guns of World War II

WAR MACHINE

Volume 2 **Issue 16**

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Editorial Offices
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Aerospace Publishing Ltd
10 Barley Mow Passage
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Managing Editor: Stan Morse
Editorial: Trisha Palmer
Chris Bishop
Chris Chant
Design: Rod Teasdale
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Artists:
Frank Kennard
Pierre Turner
Malcolm McGregor

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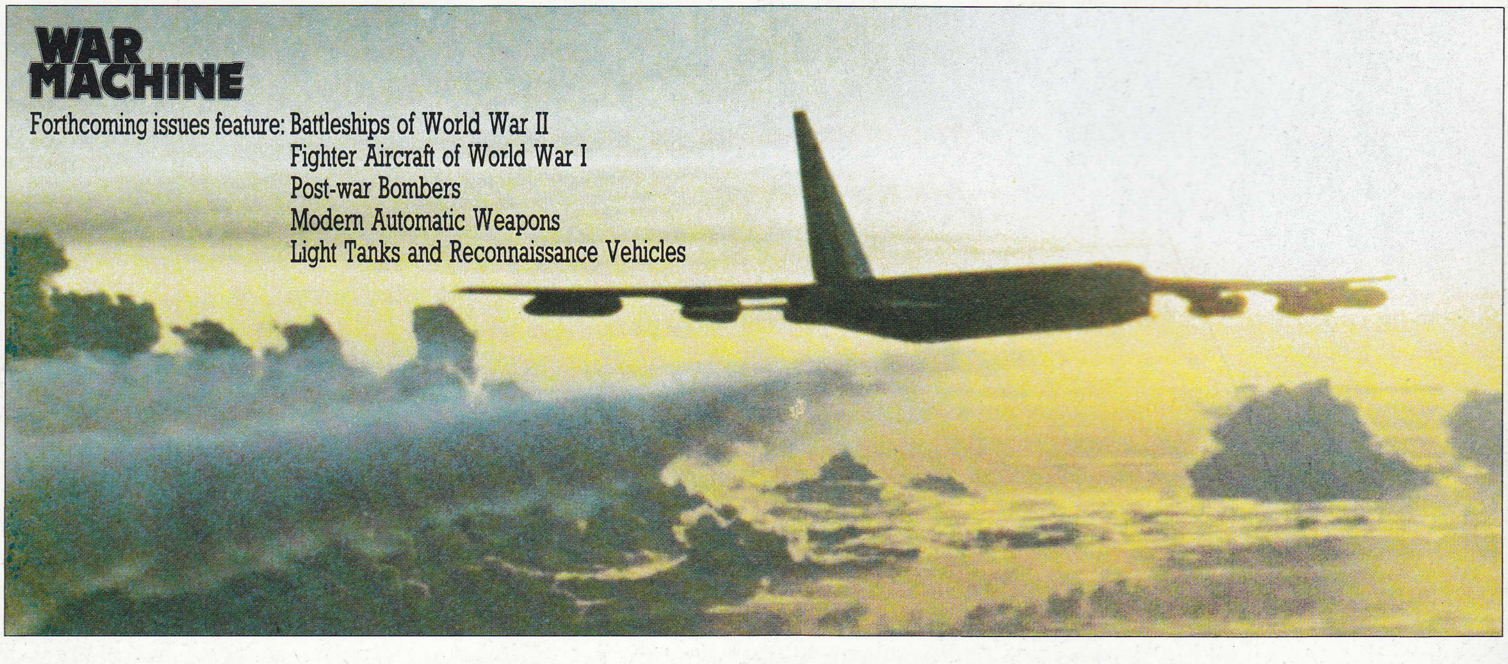

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Fighter Aircraft of World War I
Post-war Bombers
Modern Automatic Weapons
Light Tanks and Reconnaissance Vehicles

Machine-guns of World War 11

The machine-gun stood out amongst the new weapons introduced on a large scale during World War I. In fixed positions, providing direct and indirect fire in support of massed infantry, it largely dictated infantry tactics. Towards the end of the conflict, however, a new, more mobile kind of warfare emerged. The introduction of armoured vehicles, and the German infiltration tactics, meant that any future battles would be very different.

A German MG 34 gunner in the USSR. The MG 34 was the first successful general-purpose machine-gun, combining the direct firepower of the heavy machine-gun with the relative ease of handling of the light machine-gun.

During World War II the machine-gun never quite succeeded in regaining the influence over the battlefield that it managed to acquire during World War I. Generally speaking tactics were more fluid and mobility was the key concept, but this did not mean that the machine-gun had no influence on tactics: it remained a dreadful man-killer, it could still command ground, and it had been developed to still higher levels of technical perfection than the equivalent weapons of World War I.

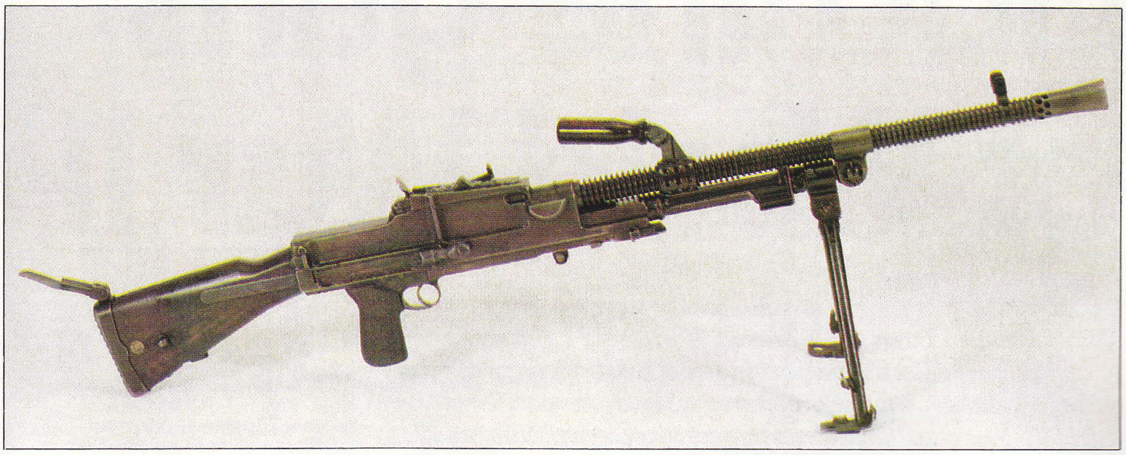
The machine-guns of 1939 to 1945 were still similar to those of World War I, but among the remaining relics of the earlier conflict there were many new designs. There was even a new type of machine-gun that had grown out of the analysed results of World War I. In that conflict there had been two machine-gun types, the light machine-gun and the heavy machine-gun: the light machine-gun could be carried by one man, was located on a small bipod for aiming and firing, and usually carried the ammunition in some form of magazine; the heavy machine-gun was a team or squad weapon capable of high and prolonged fire rates and usually mounted on a heavy tripod; it was so heavy it was virtually static. From these two types of weapon the inter-war designers produced the general-purpose machine-gun, a machine-gun light enough to be carried by one man and used as an assault weapon but still capable of being mounted on a tripod and used to produce the fire power of a heavy machine-gun. The first design to combine these two possibly opposing requirements successfully was the German MG 34, but this was only the forerunner of many designs to come.

Apart from the MG 34 there were many other superb designs of machine-gun in use (and some very poor ones to balance them, the Breda modello 1930 perhaps being one of the worst); it remains as ever a paradox that the peak of human ingenuity should be devoted to the mechanized destruction of fellow humans. Thus the years 1939 to 1945 suffered from the excellence of the Bren Gun, the American M1919 series and the power of the 12.7-mm (0.5-in) Browning. But from the design viewpoint perhaps the best design of all was the MG 34's successor, the magnificent MG 42.

November 1943, near Rome. A typical light machine-gun position. Note the spare barrel for the Bren gun kept ready to hand above the spotter; prolonged fire heated the barrel and affected accuracy, necessitating a quick change.

CZECHOSLOVAKIA

Lehky Kulomet ZB vz.26 and vz.30 light machine-guns



Above: The Czech ZB vz.26, one of the most influential designs of its day and the forerunner of the British Bren gun; this example has its straight 20- or 30-round box magazine missing.

Right: Chinese Nationalist troops fighting under General Chian Kai Shek training with a ZB vz.26 light machine-gun.

When Czechoslovakia was established as a state after 1919 it contained within its borders a wide range of skills and talents, and among them was small arms expertise. In the early 1920s a company was established at Brno under the name of Ceskoslovenska Zbrojovka for the design and production of all types of small arms. An early product was a machine-gun known as the **Lehky Kulomet ZB vz.24** using a box magazine feed, but it remained a prototype only for an even better design was on the stocks. Using some details from the vz.24 the new design was designated the **Lehky Kulomet ZB vz.26.**

This light machine-gun was an immediate success and has remained one of the most inspirational of all such weapons ever since. The vz.26 was a gas-operated weapon with a long gas piston under the barrel and fed from an adjustable gas vent about half-way down the finned barrel. Gas operating on the piston pushed it to the rear and a simple arrangement of a hinged breech block on a ramp formed the locking and firing basis. Ammunition was fed downwards from a simple incline box magazine, and the overall design emphasized the virtues of easy stripping, maintenance and use in action. Barrel cooling was assisted by the use of prominent fins all along the barrel but a simple and rapid barrel change method was incorporated.

The vz.26 was adopted by the Czech army and soon became a great export success, being used by a whole string of nations that included China, Yugoslavia and Spain. The vz.26 was followed in production by a slightly improved model, the **Lehky Kulomet ZB vz.30**, but to the layman the two models were identical, the vz.30 differing only in the way it was manufactured and in some of the internal details. Like the vz.26, the vz.30 was also an export success, being sold to such countries as Iran and Romania. Many nations set up their own production lines under licence from ZB, and by 1939 the two designs were among the most numerous light machine-gun types in the world. When Germany started to take over most of Europe, starting with Czechoslovakia, the vz.26 and vz.30 became German weapons (**MG 26(t)** and **MG 30(t)**) and even remained in production at Brno for a while to satisfy the demands of the German forces. They were used all over the world and were even issued as standard German civil and military police machine-guns. Of all the nations involved in World War II none took to the type more avidly than China where production facilities were established. Perhaps the most lasting influence the vz.26 and vz. 30 had was on other designs; the Japanese copied them and so did the Spanish who produced a machine-gun known as the **FAO.** As is related elsewhere the vz.26 was the starting point for the British Bren, and the Yugoslavs produced their own variants.

If the Czech light machine-guns had any faults it was not in performance or handling but in production, for they were very expensive to make as many of the subassemblies had virtually to be machined and milled from solid metal. But this merely made them more robust and less prone to damage. They were, and still are, excellent light machine-guns.

Specification

ZB vz.26
Calibre: 7.92 mm (0.31 in)
Length: 1161 mm (45.71 in)
Length of barrel: 672 mm (26.46 in)
Weight: 9.65 kg (21.3 lb)
Muzzle velocity: 762 m (2,500 ft) per second
Rate of fire, cyclic: 500 rpm
Feed: 20- or 30-round box

Specification

ZB vz.30
Calibre: 7.92 mm (0.31 in)
Length: 1161 mm (45.71 in)
Length of barrel: 672 mm (26.46 in)
Weight: 10.04 kg (22.13 lb)
Muzzle velocity: 762 m (2,500 ft) per second
Rate of fire, cyclic: 500 rpm
Feed: 30-round box

Waffen SS troops firing a Czech ZB vz.30, a development of the ZB vz.26; the Germans knew this gun as the MG 30(t) and used it widely.

ITALY

Breda machine-guns

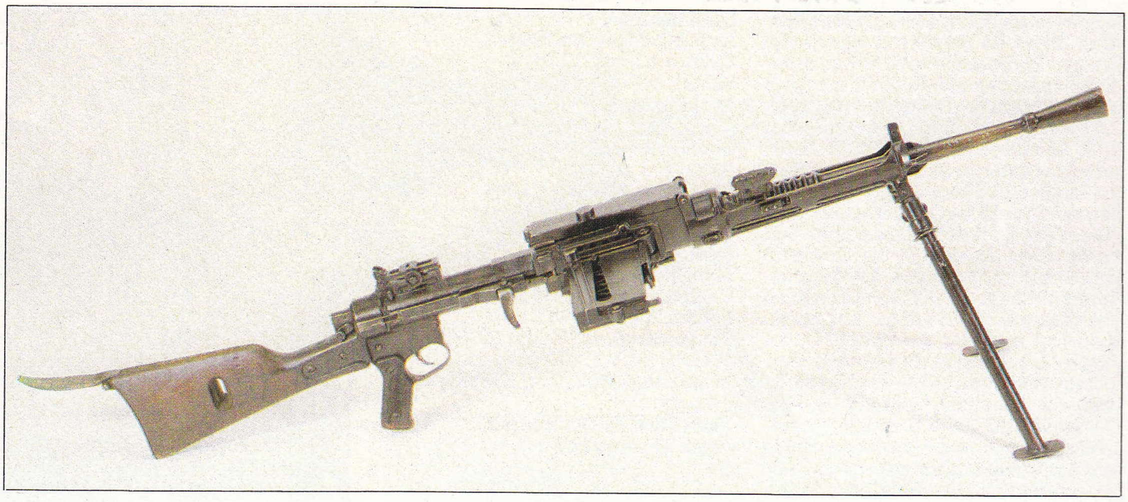
During World War I the standard Italian machine-gun was the water-cooled Fiat modello 1914 and post-war this was modernized as the air-cooled Mitriaglice Fiat modello 1914/35. But it was still a heavy weapon, even in its new air-cooled form, and a newer design of light machine-gun was initiated. The new design was produced by Breda who used the experience gained by the production of earlier models in 1924, 1928 and 1929 to produce the **Fucile Mitriagliatori Breda modello 30.** This became the standard Italian army light machine-gun of World War II.

The modello 30 was one of those machine-gun designs that could at best be deemed unsatisfactory. In appearance it looked to be all odd shapes and projections and this was no doubt a hindrance to anyone who had to carry it, for these projections snagged on clothing and other equipment. But this was not all, for the Breda designers had tried to introduce a novel feed system using 20-round chargers which were rather flimsy and gave frequent trouble. These chargers were fed into a folding magazine that had a delicate hinge, and if this magazine or the fitting was damaged the gun could not be used. To compound this problem, the extraction of the used cartridge cases was the weakest part of the whole gas-operated mechanism, and to make the gun work an internal oil pump was used to lubricate the used cases and thus assist extra extraction. While this system worked in theory the added oil soon picked up dust and other debris to clog the mechanism, and in North Africa sand was an ever-present threat. And as if this were not enough, the barrel-change method, although operable, was rendered awkward by the fact that there was no barrel handle (and thus no carrying handle), so the operator had to use gloves. With no other type in production the modello 30 had to be tolerated, and there was even a later **modello 38** version in 7.35-mm (0.29-in) calibre.

The other two Breda machine-guns were at least better than the modello 30. One was the **Mitrigliera Breda RM modello 31**, produced for mounting on the light tanks operated by the Italian army. This had a calibre of 12.7 mm (0.5-in) and used a large curved vertical box magazine that must have restricted the weapon's use in AFV interiors.

As a heavy machine-gun the company produced the **Mitragliace Breda modello 37**, and while this was overall a satisfactory weapon it did have an unusual feed feature: a flat 20-round feed tray which worked its way through the receiver to accept the spent cartridge cases. Exactly why this complex and quite unnecessary system was adopted is now impossible to ascertain, for the spent cases had to be removed from the tray before it could be reloaded with fresh rounds. The oil-pump extraction method was also used, rendering the modello 37 prone to the same debris clogging as the lighter modello 30. Thus the modello 37 was no more than adequate, even though the type became the standard Italian heavy machine-gun.

A version of the modello 37 for mounting in tanks was produced under the designation **Mitriaglice Breda modello 38.**



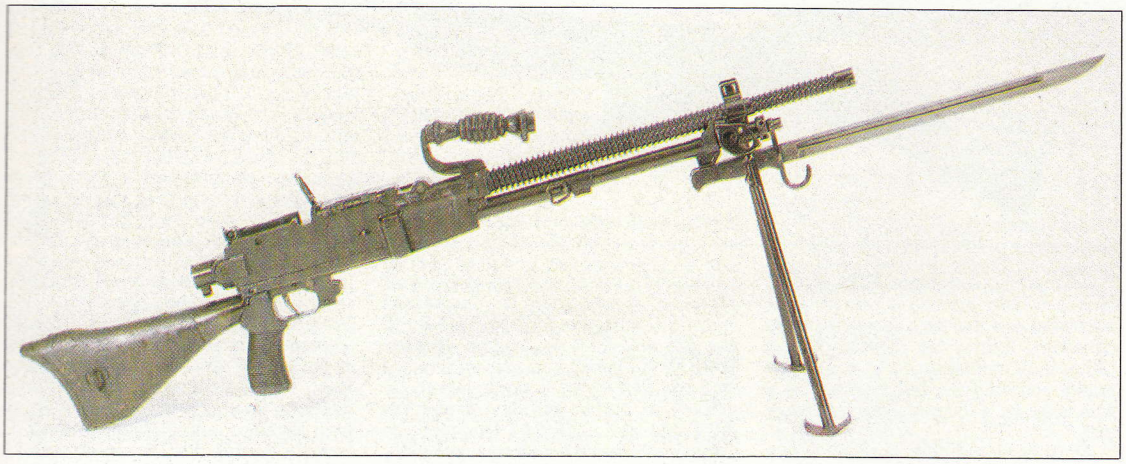
A Breda modello 30 6.5-mm (0.256-in) light machine-gun, one of the least successful machine-guns ever designed. For all its faults it served the Italians throughout the war.

Specification
modello 30
Calibre: 6.5 mm (0.256 in)
Length: 1232 mm (48.5 in)
Length of barrel: 520 mm (20.47 in)
Weight: 10.32 kg (22.75 lb)
Muzzle velocity: 629 m (2,065 ft) per second
Rate of fire, cyclic: 450-500 rpm
Feed: 20-round charger

Specification
modello 37
Calibre: 8 mm (0.315 in)
Length: 1270 mm (50.0 in)
Length of barrel: 740 mm (29.13 in)
Weight: 19.3 kg (42.8 lb)
Weight of tripod: 18.7 kg (41.2 lb)
Muzzle velocity: 790 m (2,590 ft) per second
Rate of fire, cyclic: 450-500 rpm
Feed: 20-round tray

JAPAN

Type 11 and Type 96 light machine-guns

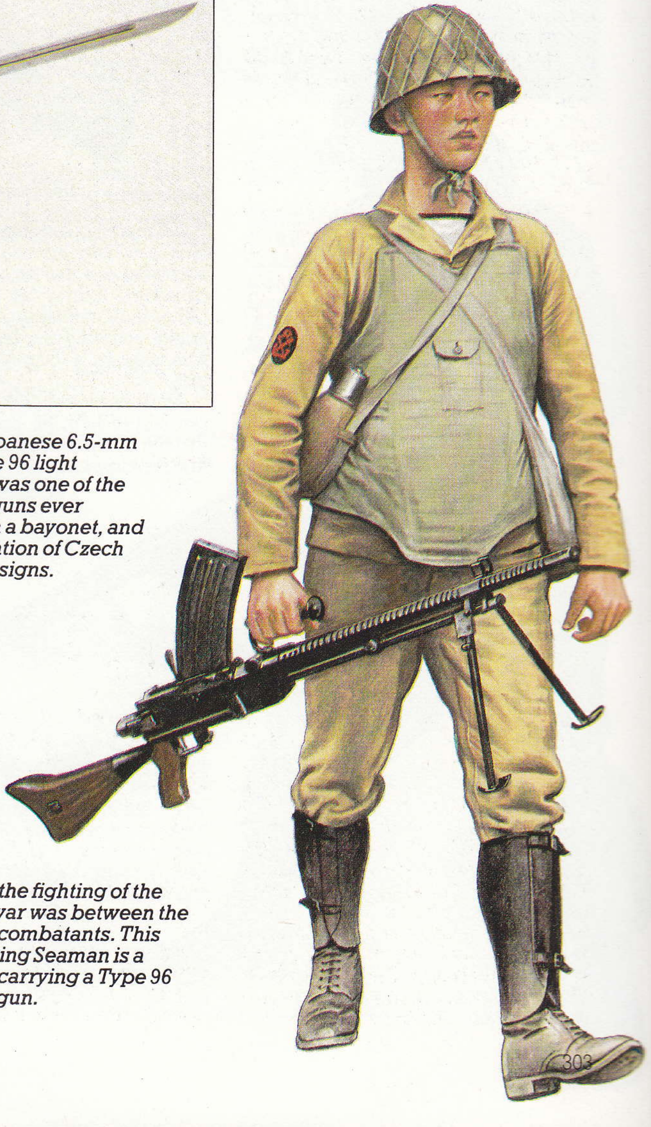


Above: The Japanese 6.5-mm (0.256-in) Type 96 light machine-gun was one of the few machine-guns ever equipped with a bayonet, and was a combination of Czech and French designs.

The Japanese heavy machine-guns used between 1941 and 1945 were both derivations of the French Hotchkiss machine-gun with only a few local changes. When it came to the lighter machine-guns the Japanese designed their own, the first of which was based on the same operating principles as the Hotchkiss but with the usual local variations.

The first of these was the 6.5-mm (0.256-in) **Light Machine-Gun Type 11**, which entered service in 1922 and remained in service until 1945. Its Hotchkiss origins were readily apparent in the heavily ribbed barrel and less obviously in the internal mechanisms. The design was credited to one General Kijiro Nambu and it was by the name of 'Nambu' that the type was known to the Allies. It was in its ammunition feed system that the Type 11 was unique, for it used a hopper system employed by no other machine-gun. The idea was that a small hopper on the left of the receiver could be kept filled with the rounds fired by the rest of the Japanese infantry squad. The rounds could be fed into the hopper still in their five-round clips, thus rendering special magazines or ammunition belts unnecessary. But in practice this advantage was negated by the fact that the internal mechanism was so delicate and complex that firing the standard rifle round caused endless troubles. Thus special low-powered rounds had to be used and things were made no better by having to use a cartridge-lubrication system that attracted the usual dust and other debris to clog the works. The Type 11 was capable of automatic fire only, and when the weapon was fired the ammunition hopper tended to make the whole system unbalanced and awkward to fire. A special version, the **Tank Machine-Gun Type 91**, was produced for use in tanks, with a 50-round hopper.

The bad points of the Type 11 became very apparent after early combat experience in China during the 1930s, and in 1936 the first examples of

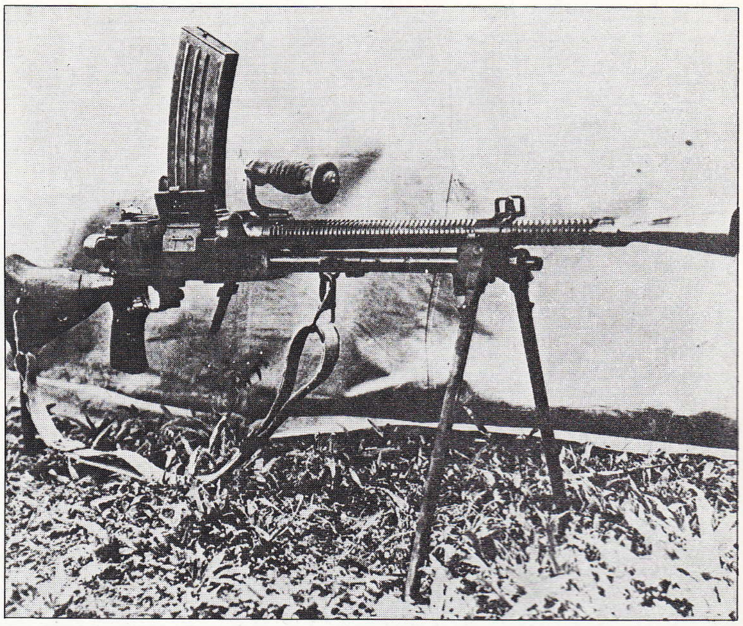


Right: Much of the fighting of the Pacific island war was between the Marines of the combatants. This Japanese Leading Seaman is a marine, and is carrying a Type 96 light machine-gun.

a new design known as **Light Machine-Gun Type 96** started to reach the troops. While the Type 96 was a definite improvement on the Type 11, it did not replace the earlier model in service, mainly as a result of the fact that Japanese industry could never produce enough weapons of any type to meet the demands of the armed forces. Overall the Type 96 used a mixture of the old Hotchkiss principles and some of the features of the Czech ZB vz.26 that the Japanese had encountered in China. One of these ex-Czech features was the overhead box magazine that replaced the hopper of the Type 11, but internally the cartridge-oiling system had to be retained along with the attendant clogging. But the Type 96 did have a quick barrel-change system and there was a choice of drum or telescopic rear sights. Once in production the telescopic sights soon became the exception, but a handy magazine-filling device was retained. One accessory that was unique to the Type 96 among all other machine-gun designs was that it had a muzzle attachment to take a bayonet.

Specification
Light Machine-Gun Type 11
Calibre: 6.5 mm (0.256 in)
Length: 1105 mm (43.5 in)
Length of barrel: 483 mm (19.0 in)
Weight: 10.2 kg (22.5 lb)
Muzzle velocity: 700 m (2,295 ft) per second
Rate of fire, cyclic: 500 rpm
Feed: 30-round hopper

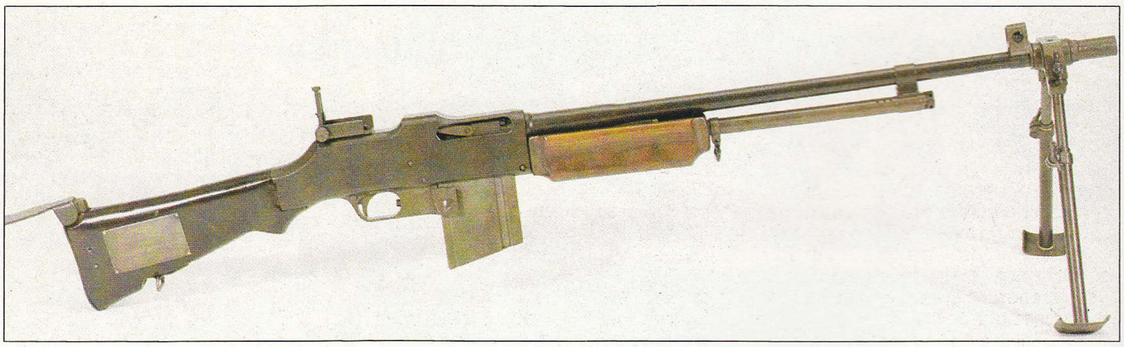
Specification
Light Machine-Gun Type 96
Calibre: 6.5 mm (0.256 in)
Length: 1054 mm (41.5 in)
Length of barrel: 552 mm (21.75in)
Weight: 9.07 kg (20 lb)
Muzzle velocity: 730 m (2,395 ft) per second
Rate of fire, cyclic: 550 rpm
Feed: 30-round box



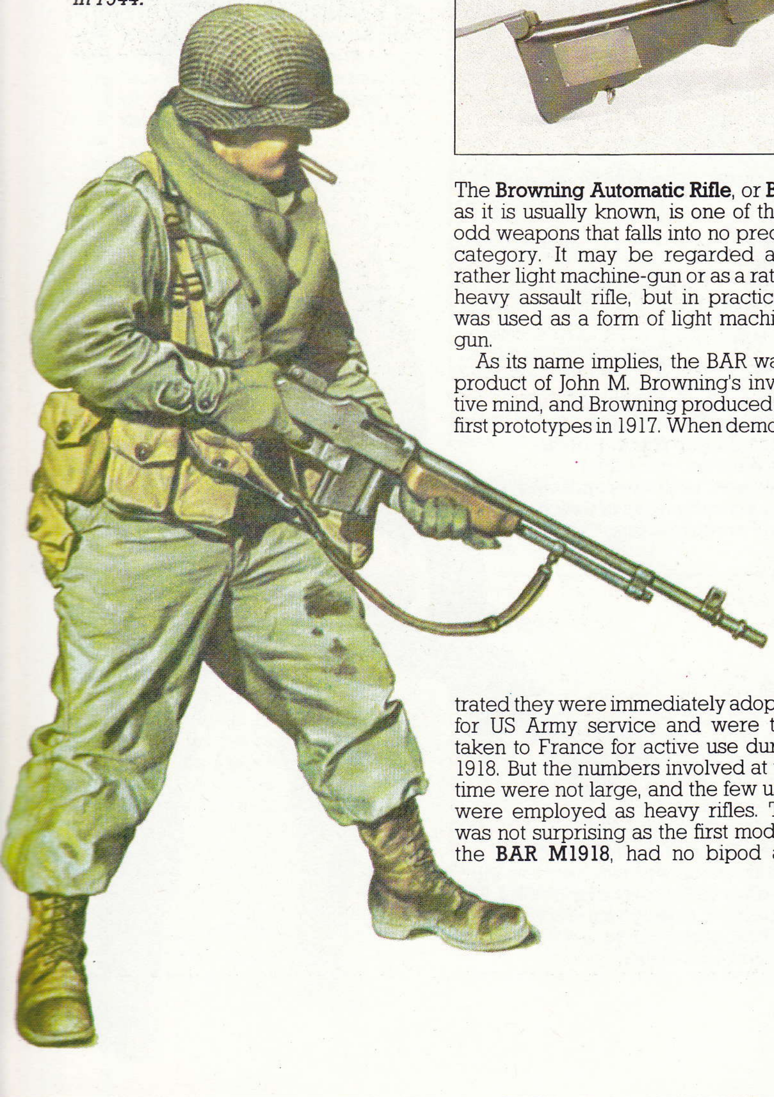
The Japanese Type 99 light machine-gun was a development of the earlier Type 96 calibred for a 7.7-mm (0.303-in) cartridge, but it retained a bayonet lug under the bipod hinge.

USA

Browning Automatic Rifle



The Browning Automatic Rifle M1918A2. The last production variant of this light machine-gun/ automatic assault rifle used a 20-round box magazine and lacked the rapid barrel change of other more modern light machine-guns. It is shown below carried by a US soldier in 1944.



The **Browning Automatic Rifle**, or **BAR** as it is usually known, is one of those odd weapons that falls into no precise category. It may be regarded as a rather light machine-gun or as a rather heavy assault rifle, but in practice it was used as a form of light machine-gun.

As its name implies, the BAR was a product of John M. Browning's inventive mind, and Browning produced the first prototypes in 1917. When demonstrated they were immediately adopted for US Army service and were thus taken to France for active use during 1918. But the numbers involved at that time were not large, and the few used were employed as heavy rifles. This was not surprising as the first models, the **BAR M1918**, had no bipod and could only be fired from the hip or shoulder. A bipod was not introduced until 1937 with the **BAR M1918A1** and the full and final production version, the **BAR M1918A2**, had a revised bipod and the facility for a stock rest to be added for added stability. It was the M1918A1 and M1918A2 that were to become the main American operational models, and they were issued to bolster squad fire power rather than as a squad support weapon.

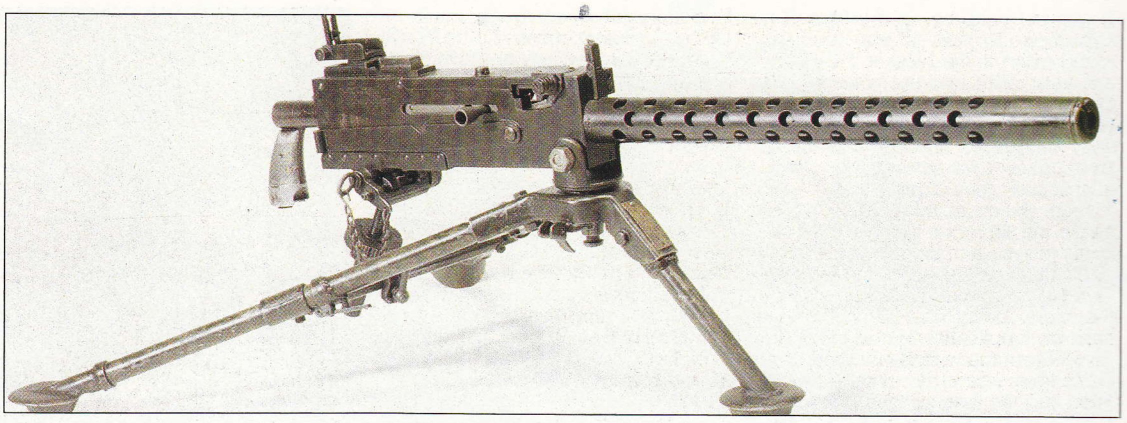
The original M1918 did have a role to play in World War II, for it was sent over to the United Kingdom in 1940 to provide some form of weapon for the British Home Guard and some found their way into other second-line use. The later models were produced in thousands in the USA and once in service in large numbers they became the sort of weapon upon which soldiers came to rely. This is not to say that the BAR did not have faults, for the box magazine had a capacity of only 20 rounds, which was far too few for most infantry operations. Being something of an interim weapon type it had few tactical adherents in the theoretical field but the soldier swore by the BAR and always wanted more that could be produced. After 1945 the BAR was used again in Korea and was not finally replaced until 1957 by the US Army. Even today new versions intended to arm police forces are still available under the name **Monitor.**

One little-known facet of BAR production is the pre-1939 output of a variant designated **modèle 30** from the Fabrique Nationale (FN) plant at Liège in Belgium. From this factory emerged a string of BAR models in various calibres for the armies of Belgium itself, Sweden, some Baltic states and some Central and South American states, including Honduras. Many found their way to the Chinese army. Poland set up a national assembly line for the BAR but their calibre was 7.92 mm (0.31 in), whereas the bulk of the FN output was in 7.65 mm (0.301 in) to suit the domestic preferred calibre. Many of these Polish BARs ended up in Soviet army hands after 1939, and even the German army used the BAR after capture from a variety of sources. The Poles thought very highly of the BAR and went to the extent of mounting the weapon on specially produced and very complex and heavy tripods; there was also a special anti-aircraft version.

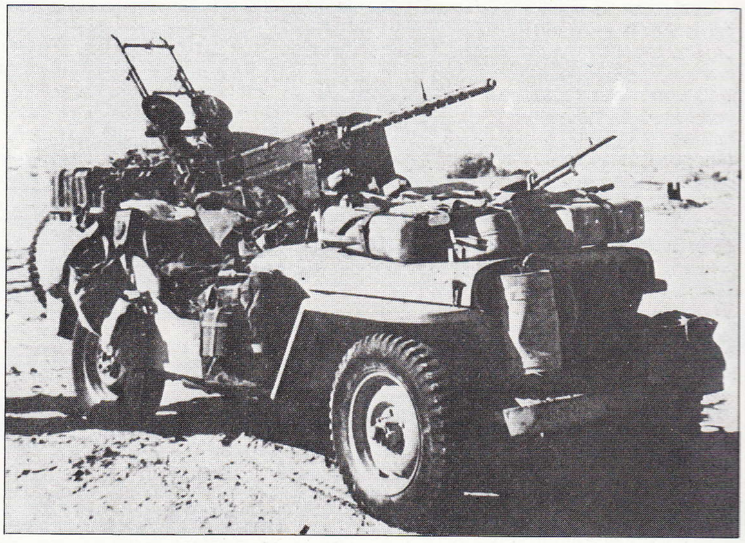
Specification
BAR M1918A2
Calibre: 7.62 mm (0.3 in)
Length: 1214 mm (47.8 in)
Length of barrel: 610 mm (24.0 in)
Weight: 8.8 kg (19.4 lb)
Muzzle velocity: 808 m (2,650 ft) per second
Rate of fire, cyclic: 500-600 rpm (fast rate) or 300-450 rpm (slow rate)
Feed: 20-round box

USA

Browning M1919 machine-guns



Above: A Browning M1919A4 machine-gun on its normal tripod and clearly showing the perforated barrel cooling jacket and the square receiver; it was produced in huge numbers and the type is still in use all over the world.



A Long Range Desert Group Jeep armed with Vickers-Berthier G.O. machine-guns and with a Browning M1919A4 mounted at the front; this gun has every appearance of being adapted from an aircraft mounting.

The **Browning M1919** series differed from the earlier M1917 series in that the original water-cooled barrel was replaced by an air-cooled barrel. This air-cooled model was originally intended for use in the many tanks the United States was going to produce, but the end of World War I led to the tank contracts being cancelled along with those for the original M1919. But the air-cooled Browning was developed into the **M1919A1**, the **M1919A2** (for use by the US Cavalry) and then the **M1919A3.** The production totals for these early models were never very high, but with the **M1919A4** the totals soared. By 1945 the production total stood at 438,971 and more have been produced since then.

The M1919A4 was produced mainly for infantry use and it proved to be a first-class heavy machine-gun capable of pouring out masses of fire and absorbing all manner of abuse and punishment. As a partner for this infantry version, a special model for use on tanks was produced as the **M1919A5.** There was also a special US Air Force model, the **M2**, for use on both fixed wing and flexible installations, and the US Navy had its own range based on the M1919A4 and known as the **AN-M2.**

Among all these types and in such a long production run there were numerous minor and major modifications and production alterations, but the basic M1919 design was retained throughout. The basic M1919 used a fabric or metal-link belt feed. The normal mount was a tripod, and of these there were many designs ranging from normal infantry tripods to large and complex anti-aircraft mountings. There were ring- and gallows-type mountings for use on all sorts of trucks from jeeps to fuel tankers, and there were numerous special mountings for all manner of small craft.

Perhaps the strangest of the M1919 variants was the **M1919A6.** This was produced as a form of light machine-gun to bolster infantry squad power, which until the introduction of the M1919A6 had to depend on the firepower of the BAR and the rifle. The M1919A6 was a 1943 innovation: it was basically the M1919A4 fitted with an awkward-looking shoulder stock, a bipod, a carrying handle and a lighter barrel. The result was a rather heavy light machine-gun that at least had the advantage that it could be produced quickly on existing production lines. Disadvantages were the general awkwardness of the weapon and the need to wear a mitten to change the barrel when it got hot. For all that the M1919A6 was churned out in large numbers (43,479 by the time production ended), and the troops had to put up with it, for it was better in its role than the BAR.

If there was one overall asset that was enjoyed by all the versions of the M1919 series of machine-guns it was reliability, for the types would carry on working even in conditions in which other designs (other than perhaps the Vickers) would have given up. They all used the same basic recoil method: muzzle gases push back the entire barrel and breech mechanism until a bolt accelerator continues the rearward movement to a point at which springs return the whole mechanism to restart the process.

The M1919 series (including the unlovely M1919A6) is still in widespread use, although the M1919A6 is now used by only a few South American states.

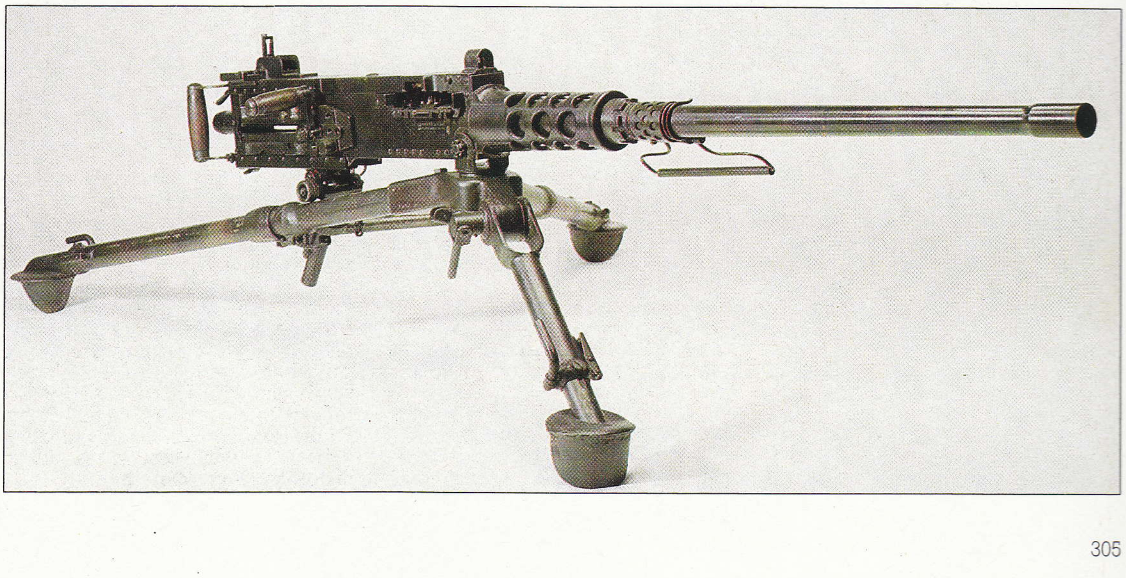
Specification
M1919A4
Calibre: 7.62 mm (0.3 in)
Length: 1041 mm (41.0 in)
Length of barrel: 610 mm (24.0 in)
Weight: 14.06 kg (31 lb)
Muzzle velocity: 854 m (2,800 ft) per second
Rate of fire, cyclic: 400-500 rpm
Feed: 250-round belt

Specification
M1919A6
Calibre: 7.62 mm (0.3 in)
Length: 1346 mm (53.0 in)
Length of barrel: 610 mm (24.0 in)
Weight: 14.74 kg (32.5 lb)
Muzzle velocity: 854 m (2,800 ft) per second
Rate of fire, cyclic: 400-500 rpm
Feed: 250-round belt

USA

Browning 12.7-mm (0.5-in) heavy machine-guns

Ever since the first Browning 12.7-mm (0.5-in) heavy machine-gun was produced in 1921 the type has been one of the most fearsome anti-personnel weapons likely to be encountered. The projectile fired by the type is a prodigious man-stopper, and the machine-gun can also be used as an armour-defeating weapon, especially when firing armour-piercing rounds. The round is really the heart of the gun, and early attempts by Browning to produce a heavy machine-gun all foundered on the lack of a suitable cartridge.



The classic Browning machine-gun on its usual tripod. It was first placed in production in 1921 and remains so, as it is one of the best anti-personnel weapons ever developed; it also has a very useful anti-armour capability.

Browning 12.7-mm (0.5-in) heavy machine-guns (continued)

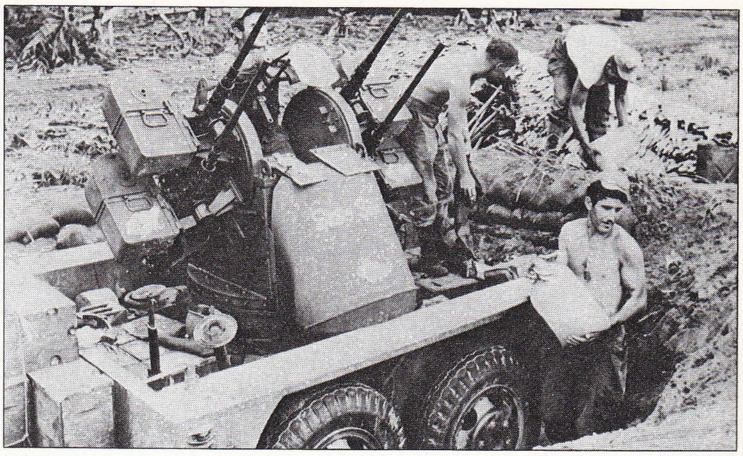
It was not until the examination of a captured German 13-mm (0.51-in) round (used in the Mauser T-Gewehr anti-tank rifle) that the solution was found, and thereafter all was well. The basic cartridge has remained essentially unchanged, although there have been numerous alternative propellants and types of projectile.

From the original **Browning M1921** heavy machine-gun evolved a whole string of variants based on what was to become known as the **M2.** On all these variants the gun mechanism remained the same, being very similar to that used on the smaller M1917 machine-gun. Where the variants differed from each other was in the type of barrel fitted and the fixtures used for mounting the gun.

One of the most numerous of the M2s has been the **M2 HB**, the suffix denoting the use of a Heavy Barrel. The HB version can be used in all manner of installations and in the past has been employed as an infantry gun, as an anti-aircraft gun and even as a fixed or trainable aircraft gun. For infantry use the M2 HB is usually mounted on a heavy tripod, but it can also be used mounted on vehicle pintles, ring mountings and pivots. Other M2 types include versions with water-cooled barrels, which were usually employed as anti-aircraft weapons, especially on US Navy vessels where during World War II they were often fixed in multiple mountings for use against low-flying attack aircraft. Single water-cooled mountings were often used to provide anti-aircraft defence for shore installations. The main change between ground-based and aircraft versions was that the aircraft model had a barrel 914 mm (36 in) long whereas the ground version had a barrel 1143 mm (45 in) long. Apart from the barrel and some mounting fixtures, any part of the M1921 and M2 machine-guns can be interchanged.

More 12.7-mm (0.5-in) Browning machine-guns have been produced in the United States than any other design. To date the figures run into millions and the production run is still not complete, for during the late 1970s two American companies found it worthwhile to put the type back into production, and the same applied to the Belgian FN concern. Many more companies throughout the world find it profitable to provide spares and other such backing for the M2 series, and almost every year another ammunition producer introduces yet another type of cartridge for use with the weapon. Many dealers find it profitable just to sell or purchase such weapons alone, so there is no sign yet that demand for the gun is weakening in any way.

The M2 will be around for decades to come, and there is no sign of any replacement. It must rank as one of the most successful machine-gun designs ever produced.

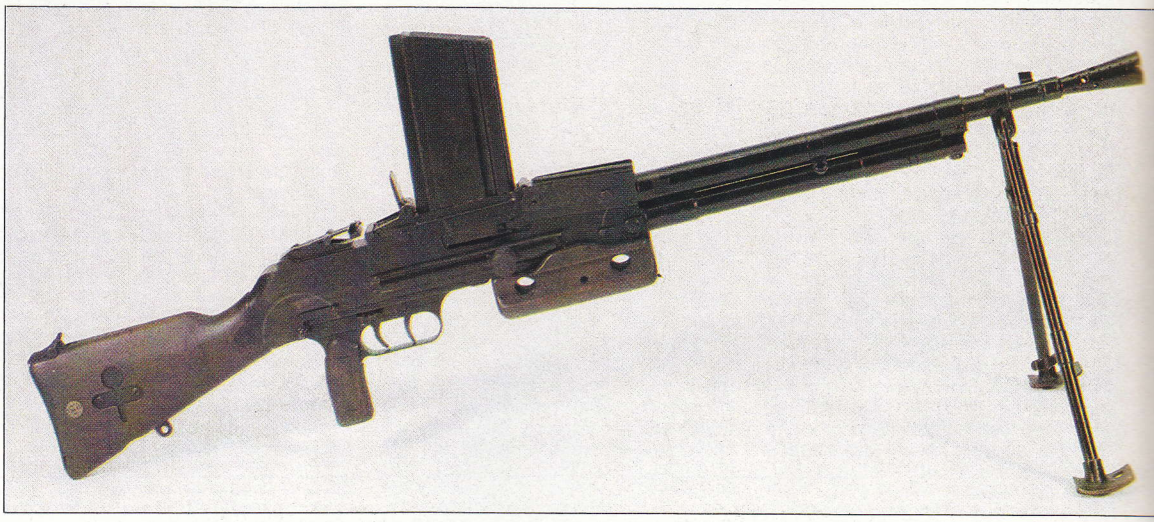


This anti-aircraft mounting, known as the M45 Maxson Mount, used four heavy barrelled Browning M2s.

Specification
M2 HB
Calibre: 12.7 mm (0.5 in)
Length: 1654 mm (65.1 in)
Length of barrel: 1143 mm (45.0 in)
Weight: 38.1 kg (84 lb)
Weight of tripod: 19.96 kg (44 lb) for M3 type
Muzzle velocity: 884 m (2,900 ft) per seond
Rate of fire, cyclic: 450-575 rpm
Feed: 110-round metal-link belt

FRANCE

Fusil Mitrailleur modèles 1924/29 and Mitrailleuse 1931 machine-guns



A Chatellerault modèle 1924/29 light machine-gun, the standard French light machine-gun of 1940; it had a calibre of 7.5 mm (0.295 in) and used two triggers, one for automatic fire and the other for single shots.

The French army was not slow to realize the impact of the light machine-gun on tactics during World War I, and soon after the Armistice spent considerable time and effort developing a national design suitable for extensive French deployment. Despite all the effort, the eventual result was a weapon with a mechanism based on that of the American Browning Automatic Rifle but altered in several ways to suit a new cartridge with a calibre of 7.5 mm (0.295 in). The first production model was the **Fusil Mitrailleur modèle 1924** (Automatic Rifle M1924), which was manufactured at the large arsenal at Saint-Etienne. The design was clean and modern-looking, and used an overhead box magazine holding 25 or 26 rounds. A dual-trigger system was provided for single shots or full automatic fire.

Unfortunately neither the gun nor the cartridge was fully developed before the type was introduced into service, resulting in a series of internal barrel explosions and other shortcomings. The solution was to redesign the cartridge to make it slightly less powerful (becoming shorter in the process) and to beef up some of the weapon's parts. The result was the **Fusil Mitrailleur modèle 1924/29**, and it was this type that eventually became the standard French light machine-gun for much of the army in 1939. A range of mountings was devised for the weapon, and there was even a small monopod for mounting under the butt to make prolonged fire more accurate.

A special variant of the mle 1924/29 was produced, initially for use in the Maginot Line defences but eventually also for tanks and other AFVs. This was the **Mitrailleuse modèle 1931**, and at first sight it had little in common with the earlier model. The mle 1931 had a peculiarly-shaped butt and a prominent side-mounted drum magazine holding no less than 150 rounds. Despite appearances the internal arrangements were the same as those of the mle 1924/29, even if the overall length and barrel length were increased. In static defences the increased weight was no handicap and the mle 1931 was produced in large numbers. In fact so many were produced that ultimately the model was used outside the concrete defences as an anti-aircraft weapon, often arranged in pairs on special or even improvised anti-aircraft mountings.

With the events of 1940 the mle 1924/29 and mle 1931 passed into German hands as the **Leichte MG 116(f)** and **Kpfw MG 331(f)** respectively. Only a relatively few remained in French hands in the Middle East and North Africa, and there they were used until 1945. After 1945 the type was once more put into production and it remained in service for many years, some examples ending up in the hands of the Viet Cong in the Far East. Post-war production involved only the mle 1924/29.

The German booty of 1940 meant that many mle 1924/29s and mle 1931 machine-guns were later incorporated into the defences of the Atlantic Wall, and the mle 1931 was especially favoured by the Germans as an anti-aircraft weapon. But for all this widespread use the mle 1924/29 and mle 1931 were never entirely trouble-free, and the cartridge they fired was generally deemed underpowered and lacking in range: maximum useful range was only 500 to 550 m (550 to 600 yards) instead of the 600+ m (655+ yards) of many contemporary designs.

Specification
Fusil Mitrailleur mle 1924/29
Calibre: 7.5 mm (0.295 in)
Length: 1007 mm (39.65 in)
Length of barrel: 500 mm (19.69 in)
Weight: 8.93 kg (19.7 lb)
Muzzle velocity: 820 m (2,690 ft) per second
Rate of fire, cyclic: 450-600 rpm
Feed: 25-round box

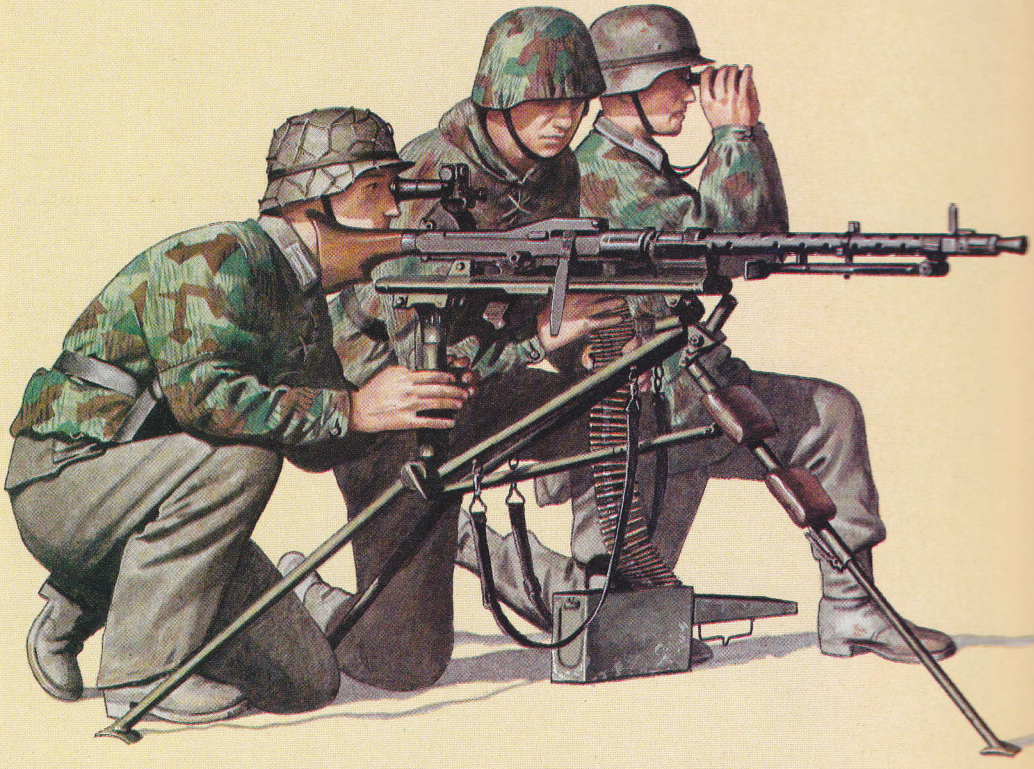
Specification
Mitrailleuse mle 1931
Calibre: 7.5 mm (0.295 in)
Length: 1030 mm (40.55 in)
Length of barrel: 600 mm (23.62 in)
Weight: 11.8 kg (26.0 lb)
Muzzle velocity: 850 m (2,790 ft) per second
Rate of fire, cyclic: 750 rpm
Feed: 150-round drum

The Battle for Normandy

Dawn of 6 June 1944 saw the start of the largest amphibious operation in history. Some of the Allied troops had fought in North Africa, or were veterans of Dunkirk, but a large proportion were going into action for the first time, with no conception of what lay ahead.

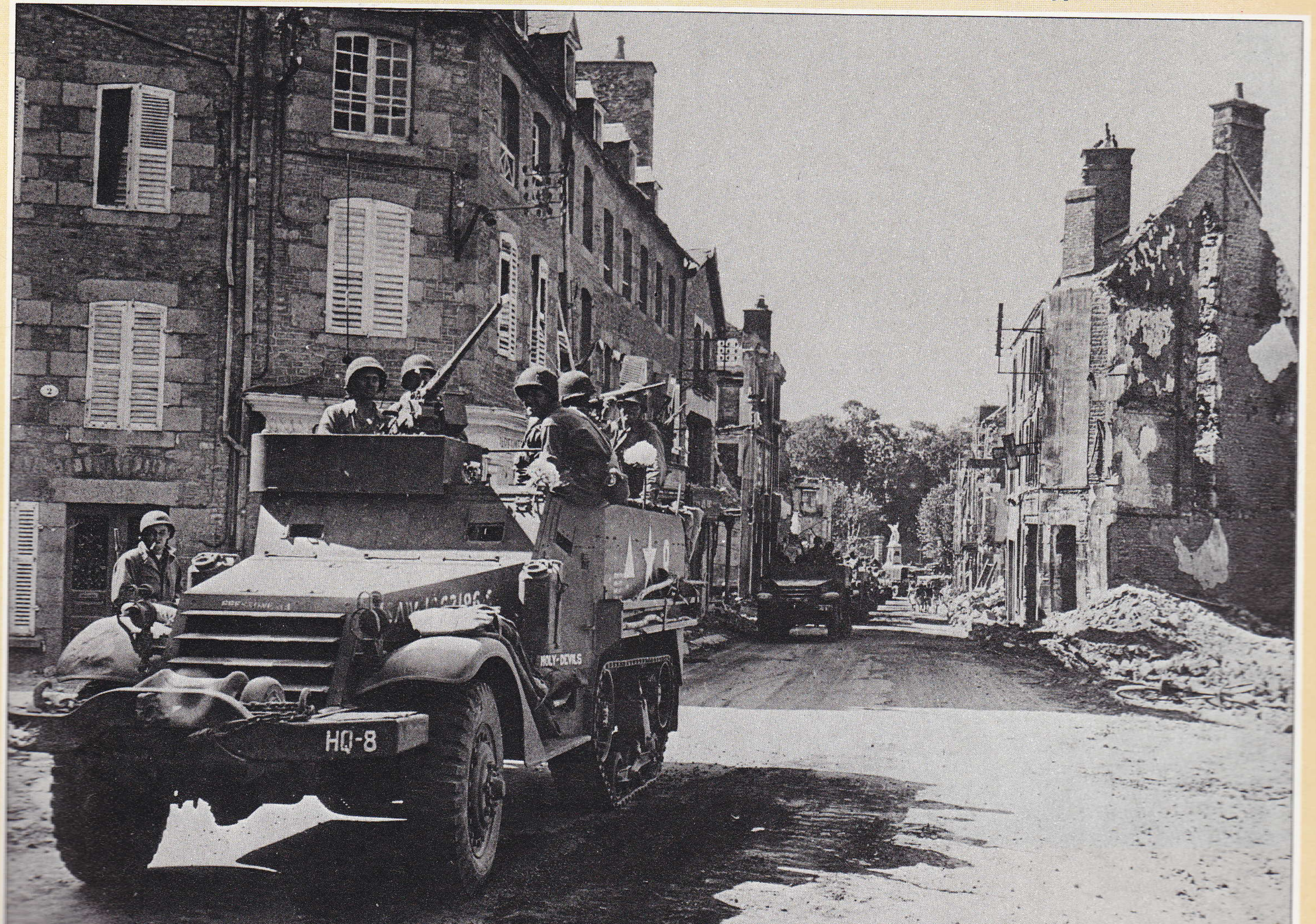
The Battle for Normandy covers the period that immediately followed the successful 'Overlord' landings on the Normandy beaches (often called the D-Day landings) until the break-out from the beach-head that culminated in the German defeat in the Falaise Pocket. The battle lasted over a month, but during that month there were few days in which combat was not constant and sometimes on a scale not encountered in Western Europe since World War I. It was a battle that is only now being considered as the pointer to the forms future warfare might take, for it was a battle in which mobility and armour had little part to play as there was no space in which they could manouevre.

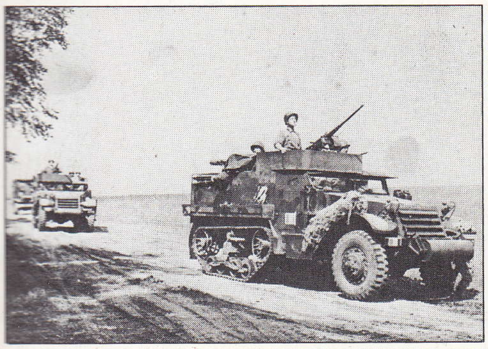
After the successful amphibious landings of 6 June 1944, the Allied troops moved inland as quickly as they could. Their reasons for doing so were several: the immediate task was to link up with the Allied airborne troops whose glider and parachute landings had enabled them to seize key points and communication bottlenecks to enable the bulk of the landing troops to move inland to their first objectives. The territory seized in this early phase was to be used to provide space for stores depots to replenish the ammunition, food and fuel that the troops would need, and ultimately it was hoped



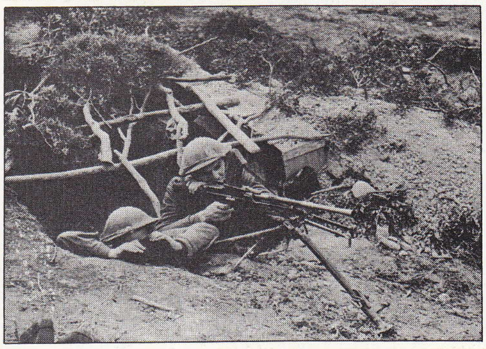
Above: In the sustained fire mode, and served by a full crew of spotter, loader and gunner, the MG 34 gave the Allied troops in Normandy a warm welcome.

Below: US Infantry on 12.7-mm (0.5-in) Browning-armed half-tracks move through Avranches. This was the end of the Battle of Normandy, as Patton's breakout was taking place.

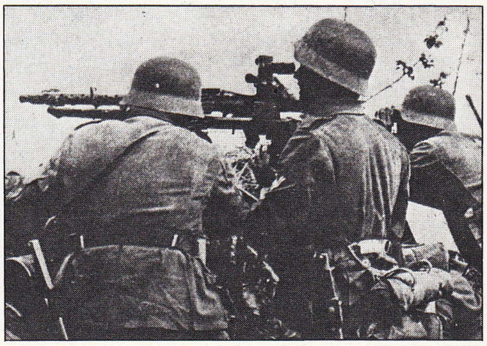




12.7-mm (0.5-in) Browning-armed half-tracks of the Second French Armoured Division, part of Patton's army which led the break-out from Normandy.



While the Bren was nominally a light machine-gun, the addition of a tripod enabled it to give accurate fire at long range.



German sustained fire was provided by a tripod-mounted MG 34 or MG 42, equipped with special sights and trigger equipment.

to construct landing sites to enable fighter, strike and reconnaissance aircraft to operate well forward without the need to fly back to the south of England after every sortie.

The first few days saw the expected consolidation of the initial beach-head, but it was not easy going. For the first few days the forward troops could call upon the guns of the offshore naval vessels whenever support was required, but thereafter the troops outranged all but the really heavy guns and these were not so flexible in their fire support as the lighter calibres. Thus the troops began to rely on their own artillery support and upon air strikes, but both were soon found to be severely hampered by the close ranges at which the attackers and the defender found themselves fighting. After only a few days the advancing troops found themselves in a terrain that had developed over the centuries to support a thriving dairy industry. Small fields were broken up by thick hedges and steep earth banks, with small clusters of farm and other buildings placed at irregular intervals. This was the *bocage* country, a country that heavily favoured the defender.

Once through the 'Atlantic Wall' network of bunkers and their supporting buildings, the attacking infantry found themselves swallowed up by the *bocage*. Armour was of little use in such country, for the thick hedges formed formidable tank obstacles and the earth banks and ditches were just as difficult an obstacle. Moreover, the hedges and buildings formed ideal ambush points and every possible point was used by the defenders who were determined to pin down the attackers as long as possible.

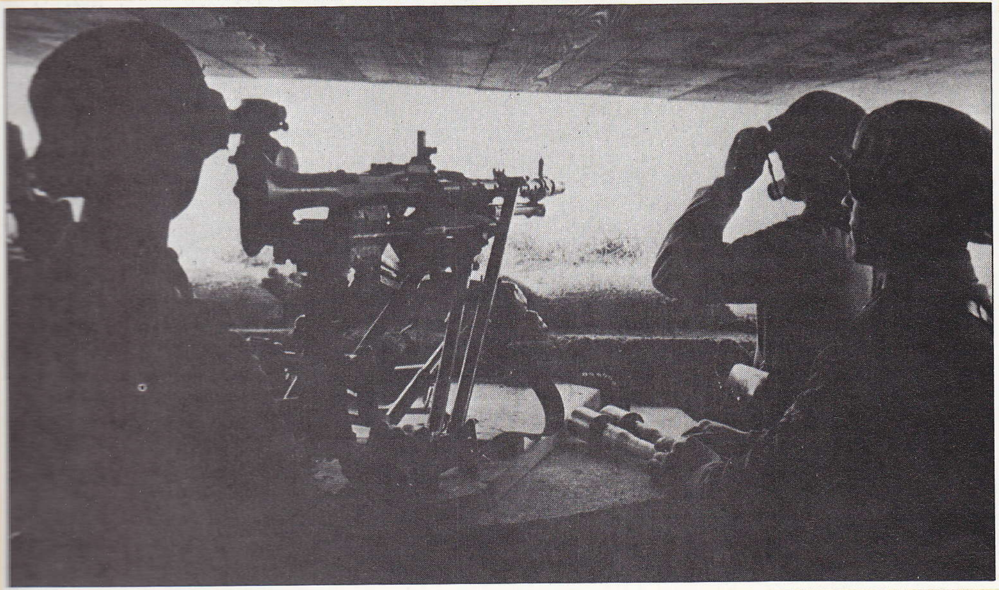
The Normandy landings had caught the German defenders badly placed during the early days. The bulk of the German forces were expecting a landing in the Pas de Calais area and were grouped accordingly: but despite the constant threat of air attack the German forces moved to the *bocage* to join the thin leavening of troops already in the area when the landings occurred. Thus the attackers found themselves moving slowly forward into an ever-growing wall of defence. Any delay that could be imposed on the attackers increased the chances of more Germans arriving to increase the defence, and after about a week all forward movement by the attacking infantry was ruled out apart from a few local successes.

Close-quarter combat

It was primarily the combination of infantry and *bocage* that imposed this impasse. Every hedge, building and gully had to be taken by the old time-honoured methods of close-quarter infantry combat. The infantry on both sides had to tackle their unenviable tasks virtually alone. There were few places where tanks could be usefully employed without incurring unbearable casualties, and the close ranges of much of the fighting ruled out much use of artillery fire. All too often unfavourable weather ruled out supporting air strikes (and for the Germans they were ruled out anyway by the Allies' air superiority). So it was close-range combat every day without respite.

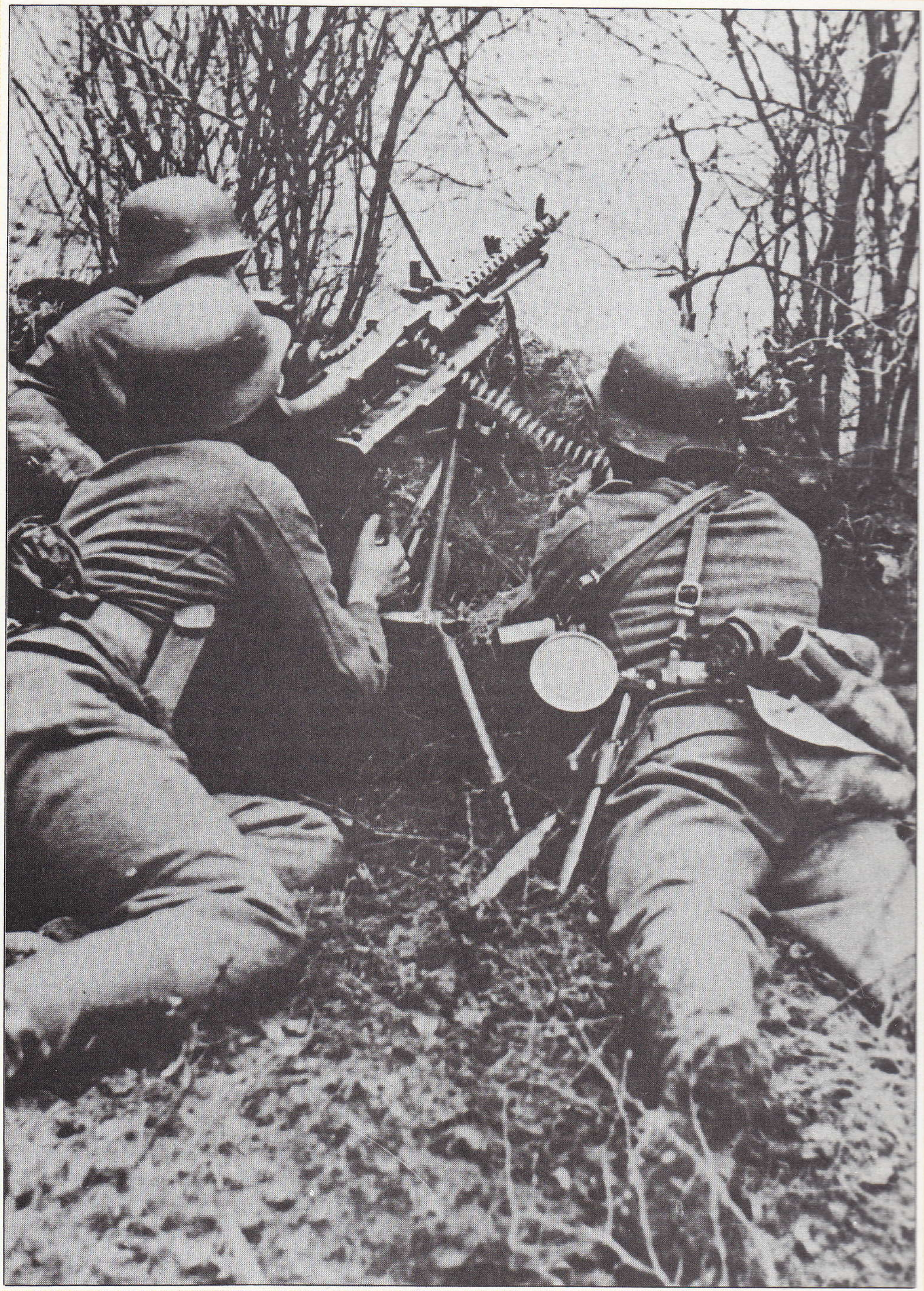
Both sides used similar tactics. These usually involved the taking of a favourable defensive position in which a section or platoon would remain. The opposing infantry would then try to saturate the position with small-arms fire while infiltrating infantry would attempt either to flank or to cut off the opposition. In such circumstances machine-guns played their usual dominant role, though it was often the portable weapons that influenced the outcome of an action. Under such close-range conditions sub-machine guns were vitally important and much more handy than the standard service rifles, their small size and rapid rate of fire often determining the outcome of the individual combats.

Most of the small-scale actions that occurred in the *bocage* took on a form of their own. The German defenders usually took up a defensive position in farm buildings with the nearby hedge covered by outposts. Sometimes a single tank might be added to boost the defences, but it could rarely use its mobility either to escape or to provide mobile fire-power. The Allied attackers approached in small groups (four or so) with supporting light machine-gun teams on a flank. The supporting machine-gun fire was supposed to keep the defenders' heads down as the assault teams moved forwards, dealing with the outpost groups as they progressed. The assault teams took with them their own Bazooka or PIAT (Projector Infantry Anti-Tank) anti-tank weapons not only to knock out any tanks that might be around but also to knock holes through the thick walls of buildings. It was all slow going. A single soldier with a rifle could hold up a platoon, and usually the ranges involved were as close as 25 m, at which casualties among the attackers could be high. The attack was supposed to end with a rush against the main defended position, but all too often the final rush was met with close-range firepower from the German infantry with their light machine-guns and sub-machine guns. Grenades were often a decider in such situations, and their use at such close quarters was lethal and destructive.



The time when the Allies were in most danger was on the beaches, with little or no armour, and exposed to MG fire from the partial fortifications of the Atlantic Wall.

An MG 34 team. Notice the squeeze trigger in the right hand of the gunner. In this mode the MG 34 provided fire at up to 1800 m (5905 ft).



So it went on for over a month. Slowly but surely the Allies pushed the Germans back, unfortunately for the Allies to what were increasingly stronger positions. Allied attacks were more frequently countered by German counterattacks, and the lines of hedges and buildings that were the front lines increasingly took on the depressing atmosphere of World War I battlefields. In the rear large armoured formations built up on both sides, waiting for their chance.

The Allies landing strategy had been based on the British and Canadian forces on the eastern side of the beach-head attracting the bulk of the German opposition to their sector of the front. The intention was that as the Germans concentrated on the British sector they would become weaker opposite the American sector, where the decisive break-out would then be made. Accordingly the British and Canadians made several set-piece attacks in the Caen area, culminating in the massive Operation 'Goodwood' battles supported by the strategic bombers of RAF Bomber Command operating in a tactical role. The country in the Caen sector was much more open than the *bocage* to the west, but the massed attacks made little headway in the face of increasing opposition. Nonetheless, the eastern offensive sucked in the German reserves to such an extent that by the end of July the American forces were able to make their armoured break-out, sweeping west and south before the bulk of the thrust turned to the east. The German armoured forces were at last offered their chance and attacked directly west at the offered flank but the Allied counter-intelligence units with their vitally-important use of the 'Ultra' secret that enabled them to read nearly all the German radio traffic had provided the important lead. The Allies allowed the Germans to move forward into a sack ready to catch them. As the German Panzers moved forward they were attacked by Allied strike aircraft armed with rockets that enabled them to pick off their targets from unclouded skies as the weather cleared.

Break-out

Then came the culmination of the Normandy battles. The hard slog around Caen at last broke through the concentrated German defences. Caen, battered by repeated heavy bomber attacks, fell at last and the ring to the south of the city was broken. British and Canadian troops surged outwards and moved south in a number of armoured columns supported by infantry units for the first time travelling into battle in armoured personnel carriers, converted tank chassis to provide them with both protection and mobility. As the British and French moved south the Germans struggled to escape from the trap into which they had placed themselves. There started a headlong rush to the east that was not to finish until the surrender of the last hapless units caught in what was to become known as the Falaise Pocket. The trap was not closed quite quickly enough and a great deal of German armour and vehicles managed to escape before the exit was finally blocked. Inside the pocket the Allied air forces ranged freely and destroyed whole masses of equipment before it was all over.

The conflict in the Falaise Pocket did not end the close infantry combat in the *bocage*. That continued for several more days as the tide of the battle to the south moved into fluid and mobile armoured warfare streaming across the open plains of northern France. Today that close-quarter conflict is now the subject of a great deal of analysis as it seems to provide the key to the nature of future conflicts. Armoured forces are unlikely to have the tactical influence they once had according to many streams of military thought, and if that occurs future combat may well assume once more the nature of the *bocage* fighting. It may well be that anti-armour defences will neutralize mobility to the extent that the 'Poor Bloody Infantry' will once more face the opposing PBI armed with little more than rifles, light automatic weapons (including sub-machine guns) and grenades. The Normandy conflict will then have been the real pointer of things to come, and despite all the technological advances of recent years it may well be that in the place of the *bocage* the towns and cities of north west Europe will act as the orchards and hedges of 1944.

For centuries the infantry has borne the brunt of any campaign: for a period during June and July 1944 it had to assume the whole burden of a campaign virtually unassisted. The infantry of both sides, Allied and German, took over a time-honoured role that despite all the huge arrays of modern armour and artillery at their backs they alone could assume. It was all desperate slogging stuff with high casualties on both sides. Today the *bocage* has once more become as timeless as it ever was and few signs now remain of the dreadful conflict that took place there so recently.

How machine-guns work

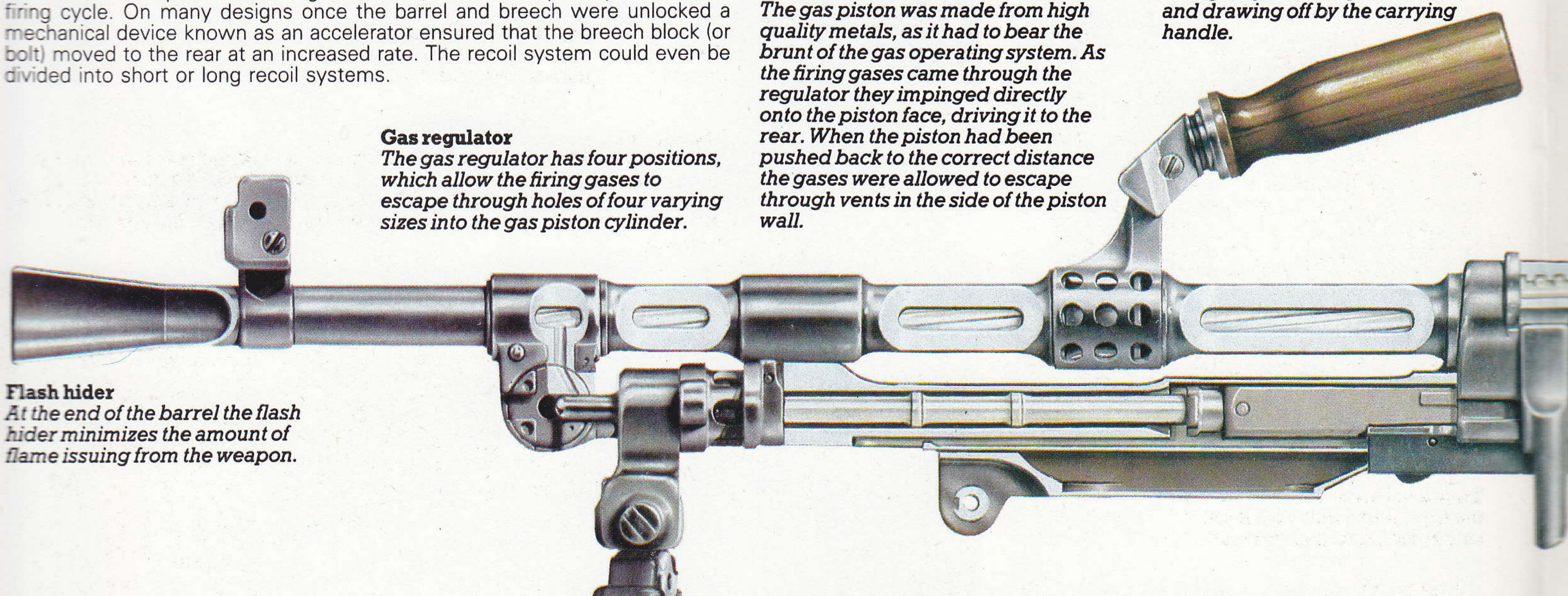
The very first machine-guns operated on what was basically a recoil principle. The very simplest operated on the blow-back principle, in which the recoil forces attendant on firing a rifle-power cartridge impinge directly on a breech block and force it back, only the mass of the block and perhaps some springs preventing the block from moving back while the internal pressures in the barrel remain at a dangerously high level. The simplicity of this system is overcome by the weights and masses involved, so the blow-back principle is not widely used in machine-guns, especially where powerful cartridges such as those in the 12.7-mm (0.5-in) calibre category are concerned.

What is required is some form of system that can operate by using the considerable energy released when a cartridge is fired without any danger of these forces endangering the weapon or the firer. Thus the breech block and the barrel have to remain 'locked' during the short period that the projectile is pushed down the barrel by the rapid gas expansion of the detonated propellant charge. This locking is usually carried out by mechanical means, and until recently the number of principles employed was legion. Only in recent years has the modern rotary lock become established to the point of virtual exclusion of other systems. But during World War II the rotary lock was well in the future and several other locking systems were thus employed.

It would be difficult to mention all these locking systems in a few lines, but suffice to say they all operated using two methods of overall propulsion. One was the recoil system and the other the gas-operated system. The recoil system usually operates by using the gases produced at the muzzle to propel the entire barrel and the locked-on breech mechanism to the rear; at some point during this rearwards progress the barrel is held by a fixed stop, leaving the breech block to move even farther backwards, taking with it the spent cartridge case until a point is reached where compressed springs push the whole arrangement back to the start position, loading a new round on the way ready for the next firing cycle. On many designs once the barrel and breech were unlocked a mechanical device known as an accelerator ensured that the breech block (or bolt) moved to the rear at an increased rate. The recoil system could even be divided into short or long recoil systems.

The gas-operated system is generally much lighter than the recoil system as the individual parts are not so highly stressed as those on the recoil system and can thus be made smaller and simpler. Thus the gas-operated system was more usually found in World War II light machine-guns. The principle uses propellant gases tapped off from a point along the barrel through which they are diverted even while the projectile is still in the barrel. This is safe as the gases have to overcome the inertia of a gas piston, which eventually moves to the rear taking the breech block away from the fixed barrel. Again, accelerators may be used but the gas pressure usually provides all the propulsion required until a point is reached where the breech is far enough to the rear for the gases to be vented through open ports in the receiver. Springs then return the piston and the breech block to the start position, loading a new round on the way. Needless to say there are several variations on this principle but they all operate along the same general lines.

The locking devices involved in both recoil and gas-operated mechanisms were many and varied. Most relied on some form of ramp or roller to form an obstacle with sufficient mechanical advantage (at the precise point when the round was fired and pressures were at their highest) to prevent the breech from moving. Some, usually involving rollers and lugs, actually used the rearward-forcing gas pressures of the cartridge case to form the 'lock' at the instant of firing, while others used a simple wedge system. Some were very complex and some were simple to the point of absurdity, but generally speaking the simpler the system the more reliable it was in operation.

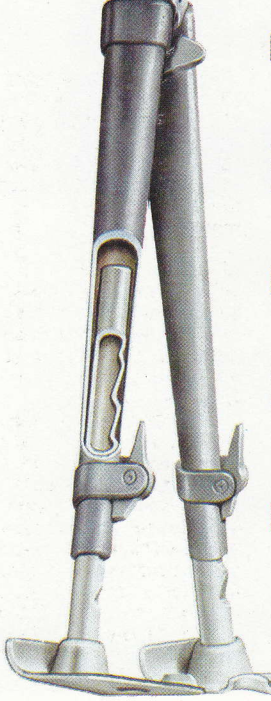


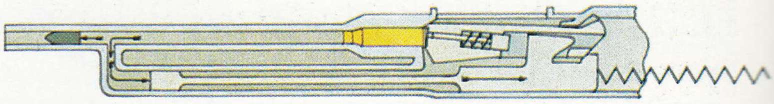
Quick release lever
The barrel was easy to change, by releasing the lever and drawing off by the carrying handle.

Gas tube and piston
The gas piston was made from high quality metals, as it had to bear the brunt of the gas operating system. As the firing gases came through the regulator they impinged directly onto the piston face, driving it to the rear. When the piston had been pushed back to the correct distance the gases were allowed to escape through vents in the side of the piston wall.

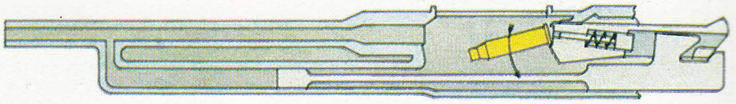
Gas regulator
The gas regulator has four positions, which allow the firing gases to escape through holes of four varying sizes into the gas piston cylinder.

Flash hider
At the end of the barrel the flash hider minimizes the amount of flame issuing from the weapon.

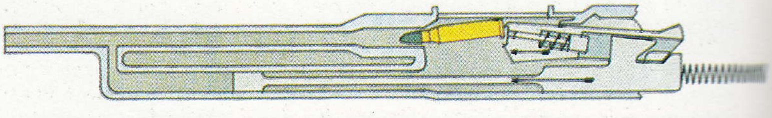




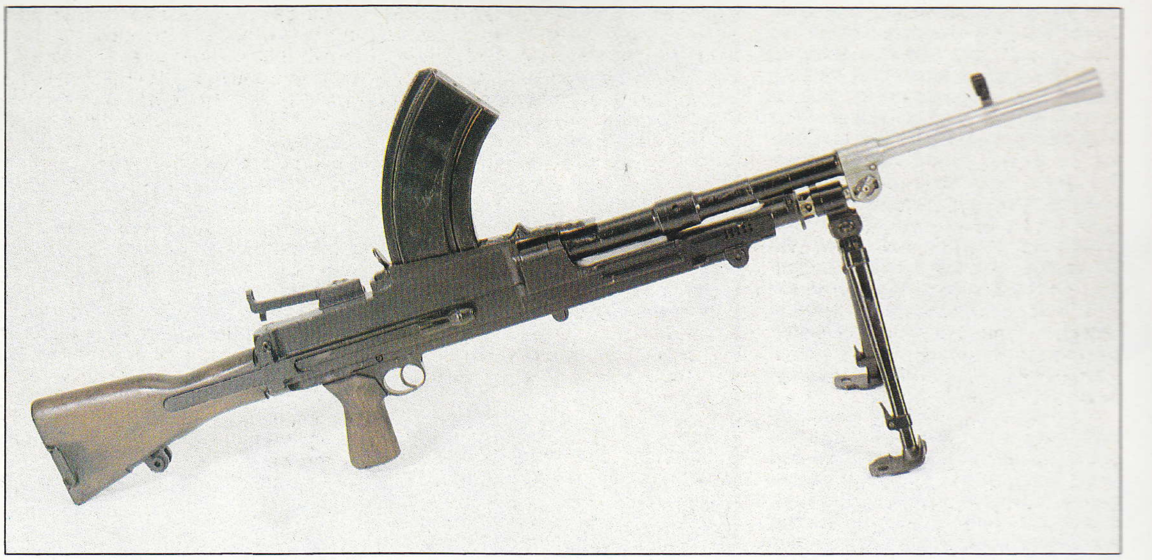
Propellant gases are drawn off through the regulator to act on a piston. This forces back the working parts, against the pressure of the return spring in the butt.



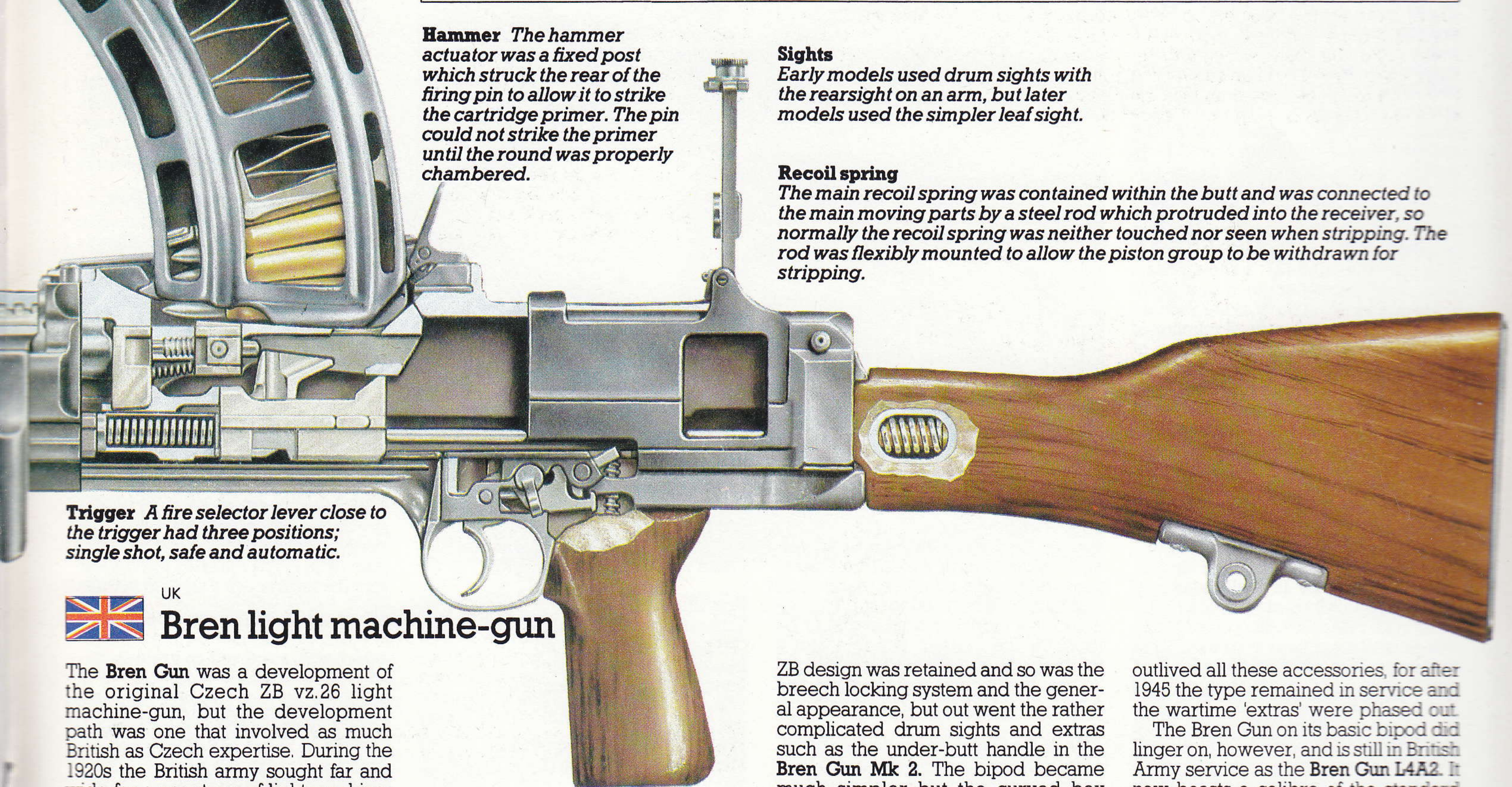
The hammer and bolt assembly, while withdrawing, extracts the empty cartridge case from the breech. Once clear it is ejected.



A fresh cartridge is fed from the magazine. The working parts are then moved back into position by the return spring in the butt.



The Bren gun is seen here in its original production form with a drum rearsight and adjustable bipod legs – later versions had these removed and replaced by simpler components.



Magazine *The magazine was curved to accommodate the rimmed 0.303-in cartridge and could hold up to 20 rounds.*

Hammer *The hammer actuator was a fixed post which struck the rear of the firing pin to allow it to strike the cartridge primer. The pin could not strike the primer until the round was properly chambered.*

Sights
Early models used drum sights with the rearsight on an arm, but later models used the simpler leaf sight.

Recoil spring
The main recoil spring was contained within the butt and was connected to the main moving parts by a steel rod which protruded into the receiver, so normally the recoil spring was neither touched nor seen when stripping. The rod was flexibly mounted to allow the piston group to be withdrawn for stripping.

Trigger *A fire selector lever close to the trigger had three positions; single shot, safe and automatic.*

UK

Bren light machine-gun

The **Bren Gun** was a development of the original Czech ZB vz.26 light machine-gun, but the development path was one that involved as much British as Czech expertise. During the 1920s the British army sought far and wide for a new type of light machine-gun to replace the generally unsatisfactory Lewis Gun, trying all manner of desgns, most of which were found wanting in some way or other. By 1930 a series of trials commenced involving several designs, among them the vz.26 in the form of a slightly revised model, the ZB vz.27. The ZB vz.27 emerged as a clear winner from these trials but it was made in 7.92-mm (0.31-in) calibre only, and the British army wanted to retain its 7.7 mm (0.303-in) cartridge with its outdated cordite propellant and its awkward rimmed case.

Thus started a series of development models that involved the vz.27, the later vz.30 and eventually an interim model, the ZB vz.32. Then came the vz.33 and it was from this that the Royal Small Arms Factory at Enfield Lock evolved the prototype of what became the Bren Gun (Bren from the BR of Brno, the place of origin, and EN from Enfield Lock). Tooling up at Enfield Lock resulted in the first production **Bren Gun Mk 1** being turned out in 1937, and thereafter the type remained in production at Enfield and elsewhere until well after 1945. By 1940 well over 30,000 Bren Guns had been produced and the type was well established in service, but the result of Dunkirk not only supplied the Germans with a useful stock of Bren Guns (**Leichte MG 138(e)**) and ammunition but also led to a great demand to re-equip the British army.

The original design was thus much modified to speed up production, and new lines were established. The original gas-operated mechanism of the ZB design was retained and so was the breech locking system and the general appearance, but out went the rather complicated drum sights and extras such as the under-butt handle in the **Bren Gun Mk 2.** The bipod became much simpler but the curved box magazine of the 7.7-mm (0.303-in) Bren was carried over. In time more simplifications were made (**Bren Gun Mk 3** with a shorter barrel and **Bren Gun Mk 4** with a modified butt assembly), and there was even a reversion to the 7.92-mm (0.31-in) calibre when Brens were manufactured in Canada for the Chinese army.

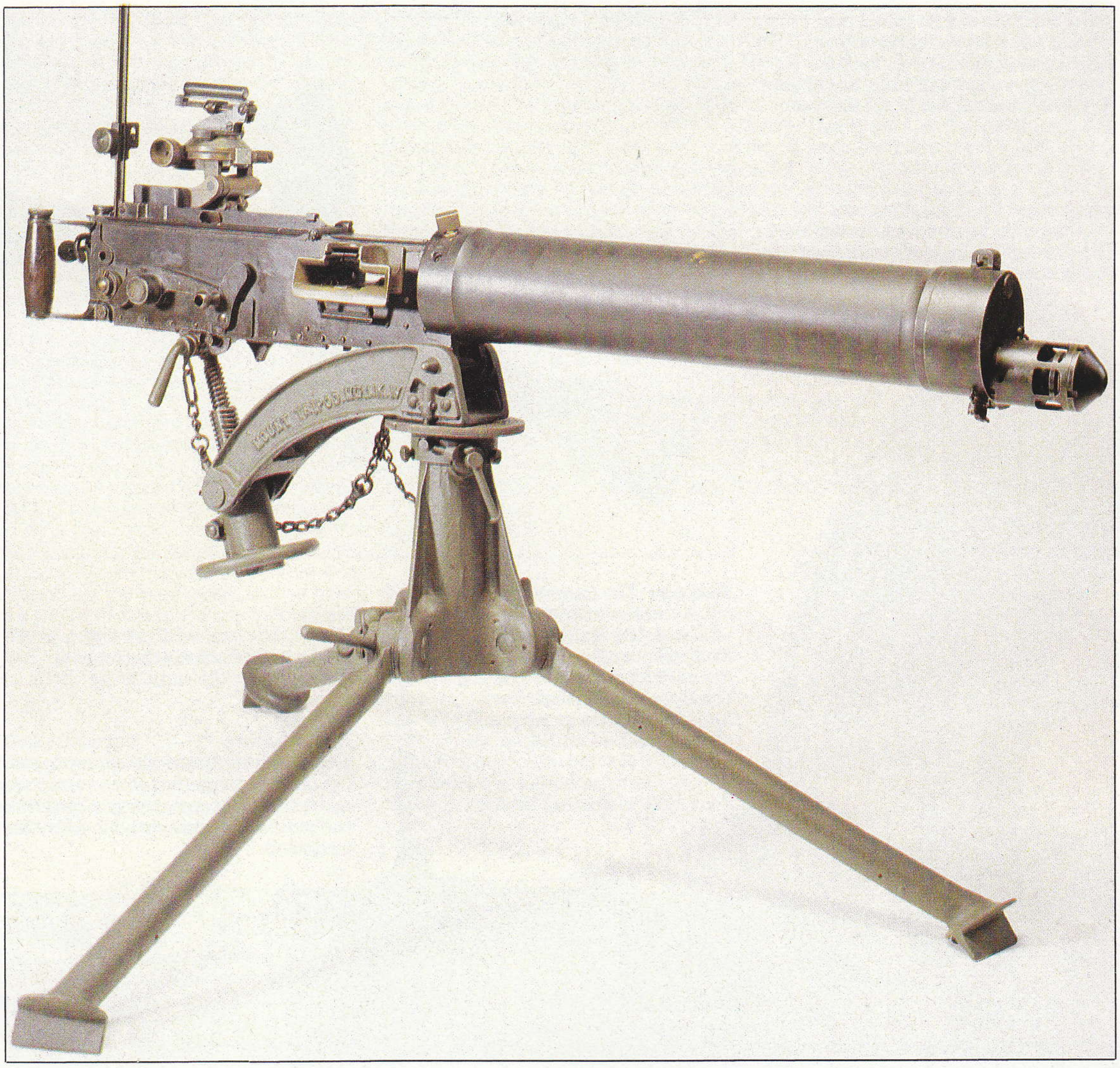
The Bren Gun turned out to be a superb light machine-gun. It was robust, reliable, easy to handle and to maintain, and it was not too heavy for its role. It was also very accurate. In time a whole range of mountings and accessories was introduced, including some rather complex anti-aircraft mountings that included the Motley and the Gallows mountings. A 200-round drum was developed but little used, and various vehicle mountings were designed and introduced. The Bren Gun outlived all these accessories, for after 1945 the type remained in service and the wartime 'extras' were phased out.

The Bren Gun on its basic bipod did linger on, however, and is still in British Army service as the **Bren Gun L4A2.** It now boasts a calibre of the standard NATO 7.62 mm (0.3 in) and the barrel is chrome-plated to reduce wear and the need to change barrels during prolonged fire using the simple barrel-change device. Today the type is still in army service with second-line and support arms and also with the Royal Navy, and there seems to be no replacement for the type in sight. It was and still is an excellent light machine-gun.

Specification

Bren Light Machine-Gun Mk 1
Calibre: 7.7 mm (0.303 in)
Length: 1156 mm (45.5 in)
Length of barrel: 635 mm (25.0 in)
Weight: 10.03 kg (22.12 lb)
Muzzle velocity: 744 m (2,440 ft) per second
Rate of fire, cyclic: 500 rpm
Feed: 20-round box magazine

Vickers machine-guns



A Vickers machine-gun in its late production form with no corrugations on the barrel jacket, the final form of the muzzle attachment and the indirect-fire sight in position.

The **Vickers machine-gun** range had its origins in the Maxim gun of the late 19th century, and was little changed from the original other than that the Maxim locking toggle design was inverted in the Vickers product. The **Vickers Machine-Gun Mk 1** had performed well in World War I, outperforming in many ways nearly all of its contemporaries. Consequently after 1918 the Vickers remained the standard heavy machine-gun of both the British army and many of the Commonwealth forces as well. Many were exported all over the world but many of these were ex-stock weapons as production was kept at a very low ebb at Vickers' main production plant at Crayford in Kent.

However, some innovations were introduced before 1939; the introduction of the tank in all its various forms had led to the design of Vickers machine-guns to arm the new fighting machines, and by 1939 Vickers had in production two types of special tank machine-gun. These were in two calibres: the **Vickers Machine-Gun Mks 4B, 6, 6*** and **7** being of 7.7-mm (0.303-in) calibre and the **Vickers Machine-Gun Mks 4** and **5** of the 12.7-mm (0.5-in) type firing a special cartridge. Both were produced for all types of tank initially, but the introduction of the air-cooled Besa machine-guns for the bulk of the heavier tanks meant that most of the Vickers tank machine-guns ended up either in the light tank series or in the infantry tank types, the Matilda 1 and 2. The 12.7-mm (0.5-in) machine-guns were also produced in a variety of forms for the Royal Navy as the **Vickers Machine-Gun Mk 3** with all manner of mountings for anti-aircraft defence of ships and shore installations. The ship installations included quadruple mountings, but the cartridge produced for the weapon was not a success and proved underpowered. Nevertheless, in the absence of an alternative the weapon was produced in some numbers, only later being replaced by 20-mm cannon and other such weapons.

Thus 1939 found the Vickers machine-gun in service still and in some numbers. By 1940 all manner of ancient models from stock were being used in all roles including emergency anti-aircraft mountings to bolster home defences and production was soon under way again in large quantities. Demand was so heavy (most of the British army's machine-gun stocks were lost before and during the Dunkirk episode) that production short-cuts were introduced, the most noticeable of which was the replacement of the corrugated barrel water jacket by a simple smooth jacket. Later a new muzzle booster design was introduced and by 1943 the new Mark 8Z boat-tailed bullet was in widespread use to provide a useful effective range of no less than 4100 m (4,500 yards). This enabled the Vickers machine-gun to be used for the indirect fire role and a mortar sight was adapted for the role.

After the war the Vickers served on (and still does) with armies such as those of India and Pakistan. The British army ceased to use the type in 1968 but the Royal Marines continued to use theirs until well into the 1970s.

Specification

Vickers Machine-Gun Mk 1

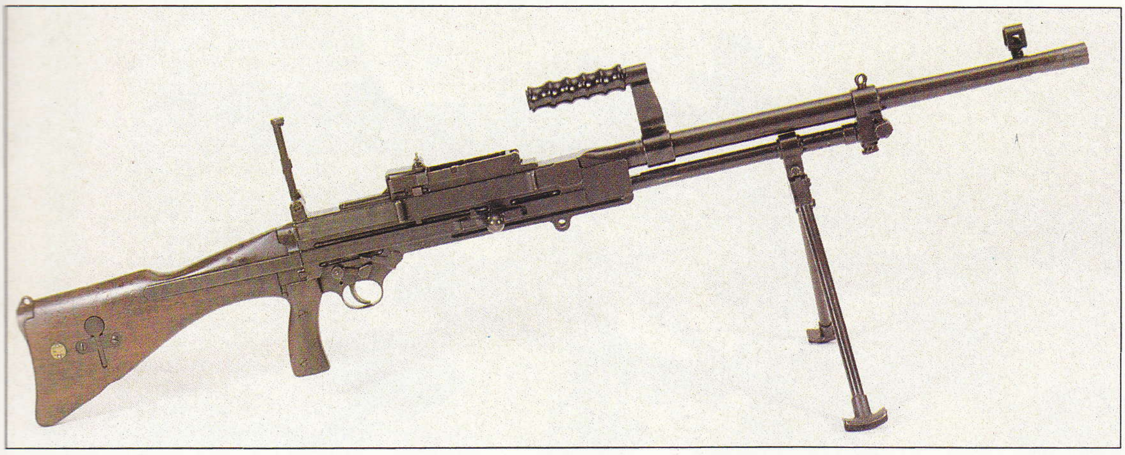
Calibre: 7.7 mm (0.303 in)
Length: 1156 mm (45.5 in)
Length of barrel: 721 mm (28.4 in)
Weight of gun: 18.1 kg (40 lb) with water
Weight of tripod: 22 kg (48.5 lb)
Muzzle velocity: 744 m (2,440 ft) per second
Rate of fire, cyclic: 450-500 rpm
Feed: 250-round belt

Men of the Cheshire Regiment using their Vickers machine-guns on a range, in about 1940; note the water cans to retain evaporated steam from the barrel jacket.

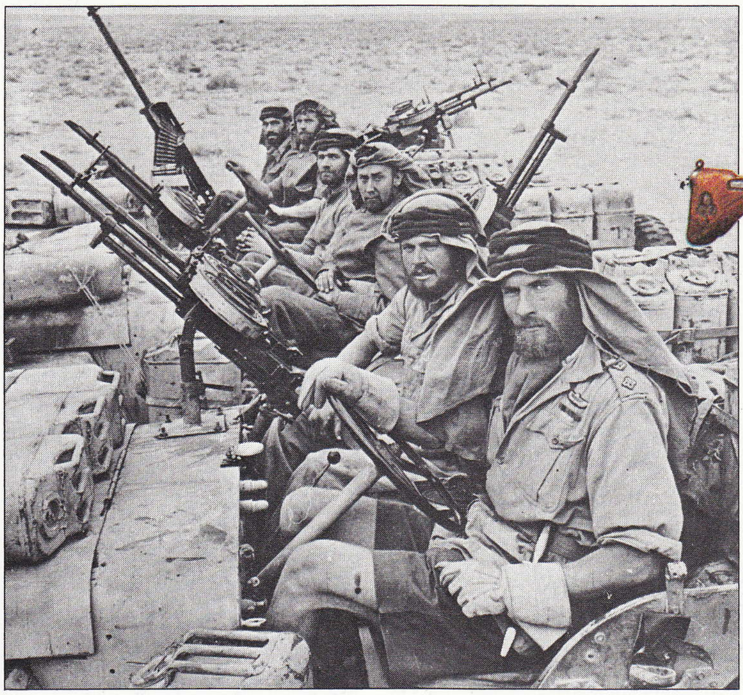
The machine-gun seen here is not the usual 7.7-mm (0.303-in) version but a heavier 12.7-mm (0.5-in) version which was originally produced for use on light tanks; it is seen here in use on a Chevrolet truck belonging to the Long Range Desert Group.

UK

Vickers-Berthier light machine-guns



Above: The Vickers-Berthier Mk 3B produced for the Indian Army, showing the overall clean lines and general resemblance to the Bren gun; the 30-round box magazine is not fitted.



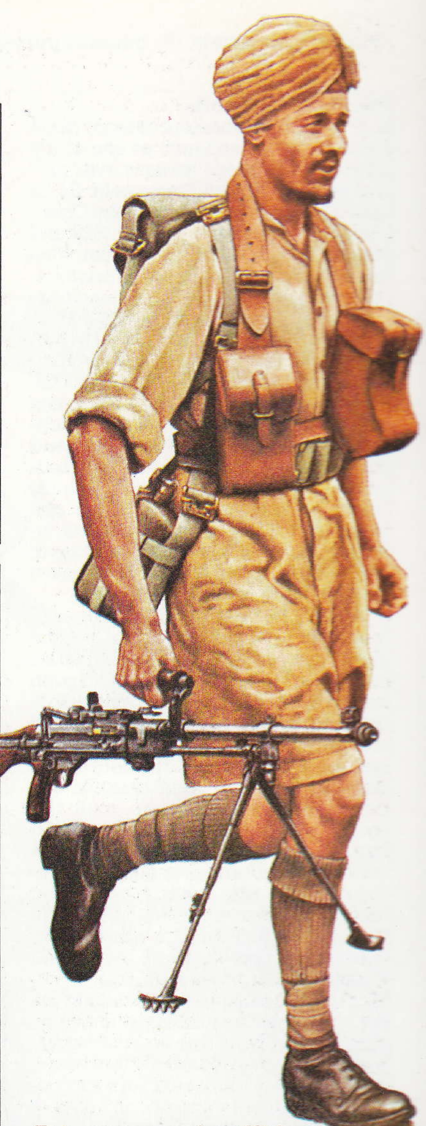
Right: A patrol of the newly-formed SAS in North Africa in 1943; their Jeeps are liberally armed with Vickers-Berthier G.O. guns and they have 96-round drum magazines.

The **Vickers-Berthier** series of light machine-guns originally evolved from a French design produced just before World War I. Despite some promising features the design was not adopted in useful numbers by any nation, but in 1925 the British Vickers company purchased licence rights on the type, mainly to keep its Crayford production lines in being with a new model to replace the Vickers machine-gun. After a series of British army trials the type was adopted by the Indian army as its standard light machine-gun and eventully a production line for this **Vickers-Berthier Light Machine-Gun Mk 3** was established at Ishapore.

In general appearance and design the Vickers-Berthier light machine-gun was similar to the Bren Gun, but internally and in detail there were many differences. Thus at times the Vickers-Berthier was often referred to by observers as the Bren. Apart from the large Indian Army contract the only other sales were to a few Baltic and South American states, and today the Vickers-Berthier is one of the least known of all World War II machine guns. This is not because there was anything wrong with the type (it was a sound and reliable design) but because it had poor 'press' coverage and numerically was well outnumbered by the Bren Gun. But even today it remains in reserve use in India.

There was one Vickers-Berthier gun derivative that did, however, obtain a much better showing. This was a much-modified version of the basic design with a large drum magazine mounted above the receiver and a spade grip fixed to the rear where the butt would normally have been. This was a special design intended for open cockpit aircraft, and was intended for use on a Scarff ring by the observer. Large numbers of this design were produced for the Royal Air Force, by whom it was known as the **Vickers G.O** (G.O. for gas operated) or **Vickers K** gun, but almost as soon as the type was introduced into service the open cockpit era came to a sudden close with the introduction of higher speed aircraft. The Vickers G.O. proved difficult to use in the close confines of aircraft turrets and impossible to use in wing installations, so it was placed almost immediately into store; some were used by the Fleet Air arm on such aircraft as the Swordfish and thus remained in use until 1945 but their numbers were relatively few.

In 1940 many Vickers G.O. guns were taken out of store and widely used on various emergency mountings for anti-aircraft defences on airfields and other such installations. In North Africa the Vickers G.O. was avidly seized upon by the various irregular forces that sprang up for behind-the-lines operations, and the Vickers G.O. was thus used by such units as 'Popski's Private Army' on their heavily armed jeeps and trucks. The weapon proved ideal in the role and gave a good indication of how the original Vickers-Berthier machine-guns would hve stood up under such conditions if they had been given the chance. The Vickers G.O. guns were used right until the end of the war in Italy and a few other theatres and they then passed right out of use, once more outnumbered by the more generally available Bren Guns.



This sepoy, carrying a Vickers-Berthier Mk 3, is dressed in standard issue khaki drill, with two large pouches for spare magazines. The Indian Army was the major user of the Vickers-Berthier gun.

Specification

Vickers-Berthier Light Machine-Gun Mk 3
Calibre: 7.7 mm (0.303 in)
Length: 1156 mm (45.5 in)
Length of barrel: 600 mm (23.6 in)
Weight: 11.1 kg (24.4 lb)
Muzzle velocity: 745 m (2,450 ft) per second
Rate of fire, cyclic: 450-600 rpm
Feed: 30-round box

Specification

Vickers G.O. Gun
Calibre: 7.7 mm (0.303 in)
Length: 1016 mm (40.0 in)
Length of barrel: 529 mm (20.83 in)
Weight: 9.5 kg (21 lb)
Muzzle velocity: 745 m (2,450 ft) per second
Rate of fire, cyclic: 1,000 rpm
Feed: 96-round drum

GERMANY

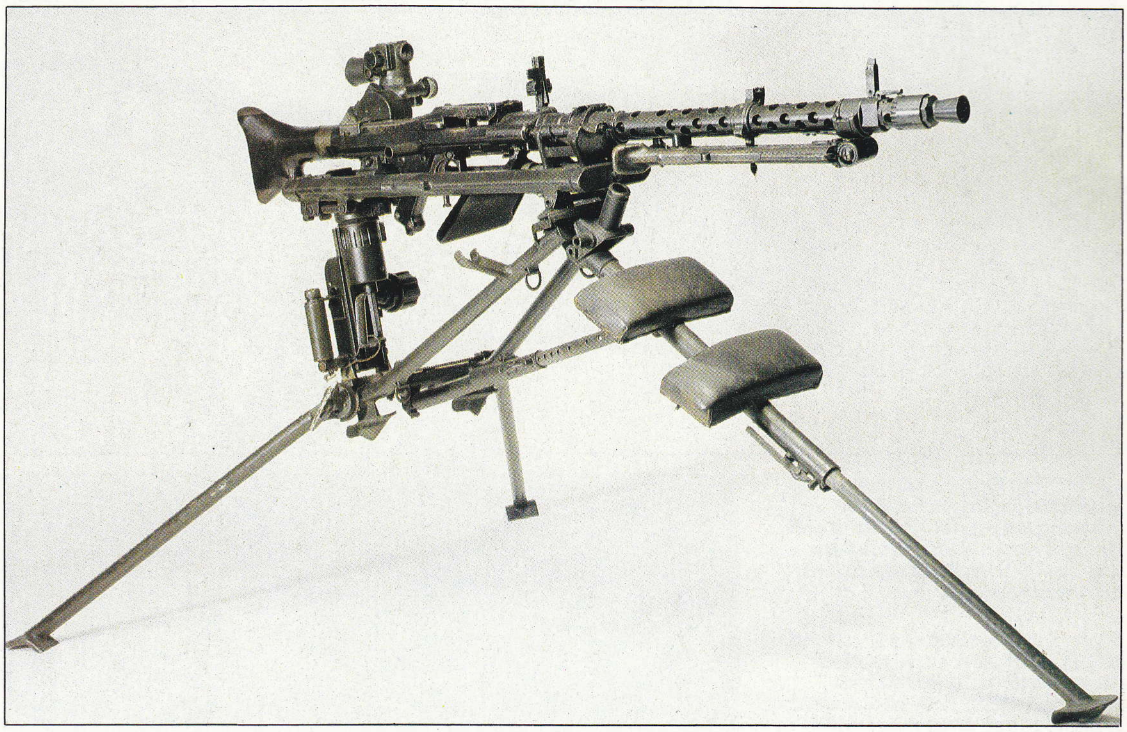
Maschinengewehr 34 general-purpose machine-gun

The terms of the Versailles Treaty of 1919 specifically prohibited (by means of a special clause) the development of any form of sustained-fire weapon by Germany, but this provision was circumvented by the arms concern Rheinmetall-Borsig by the simple expedient of setting up a 'shadow' concern under its control over the border at Solothurn in Switzerland during the early 1920s. Research carried out into air-cooled machine-gun designs resulted in a weapon that evolved into the **Solothurn Modell 1930**, an advanced design that introduced many of the features that were incorporated in later weapons. A few production orders were received, but it was felt by the Germans that something better was required and thus the Modell 1929 had only a short production run before being used as the starting point for an aircraft machine-gun, the **Rheinmetall MG 15**. This long remained in production for the Luftwaffe.

From the Rheinmetall designs came what is still considered as one of the finest machine-gun designs ever produced, the **Maschinengewehr 34** or **MG 34.** Mauser designers at the Obendorff plant used the Modell 1929 and the MG 15 as starting points for what was to be a new breed of machine-gun, the general-purpose machine-gun. This new type could be carried by an infantry squad and fired from a bipod or mounted on a heavier tripod for sustained fire over long periods. The mechanism was of the all-in-line type and the barrel had a quick-change facility for cooling. The feed was of two types, using either the saddle-drum magazine holding 75 rounds inherited from the MG 15 or a belt feed. To add to all this technical innovation the MG 34 had a high rate of fire and could thus be effective against low-flying aircraft.

The MG 34 was an immediate success and went straight into production for all the various arms and auxiliaries of the German armed forces (and even the police). Demand for the MG 34 remained high right until 1945, and consistently outstripped supply. The supply situation was not aided by the number of mounts and gadgets that were introduced to go with the weapon. These varied from heavy tripods and twin mountings to expensive and complex fortress and tank mountings. There was even a periscopic gadget to enable the weapon to fire from trenches. These accessories consumed a great deal of production potential to the detriment of gun production proper, but production of the MG 34 was in any case not aided by one fact and that was that the design was really too good for military use. It took too long to manufacture and involved too many complex and expensive machining processes. The result was a superb weapon, but actually using it was rather like using a Rolls-Royce car for ploughing a field – it was too good for the task. Thus the German forces found themselves using a weapon they could not afford in terms of production potential, while demands meant they had to keep production going until the end.

Variants of the basic model were the **MG 34m** with a heavier barrel jacket for use in AFVs, and the shorter **MG 34s** and **MG 34/41** intended for use in the AA role and capable of automatic fire only. The overall length and barrel length of the two latter were about 1170 mm (46 in) and 560 mm (22 in) respectively.



An MG 34 mounted for the heavy machine-gun role on a Lafette 34 tripod and complete with the indirect-fire sight; the pads on the front leg rested against the carrier's back when folded for transport.

Specification

MG 34

Calibre: 7.92 mm (0.31 in)
Length: 1219 mm (48.0 in)
Length of barrel: 627 mm (24.69 in)
Weight: 11.5 kg (25.4 lb) with bipod
Muzzle velocity: 755 m (2,475 ft) per second
Rate of fire, cyclic: 800-900 rpm
Feed: 50 round belt (five belt lengths), or 75-round saddle drum

An MG 34 advancing through the USSR with the man on the right carrying the folded Lafette 34, the man in the centre the MG 34 and the one on the right with a spare barrel slung across his back; the other man by the MG 34 carrier has an ammunition case.

Two Afrika Korps soldiers with an MG 34 in the heavy machine-gun role on a Lafette 34. By removing the indirect fire sights and trigger, the MG 34 quickly converts to an LMG.

GERMANY

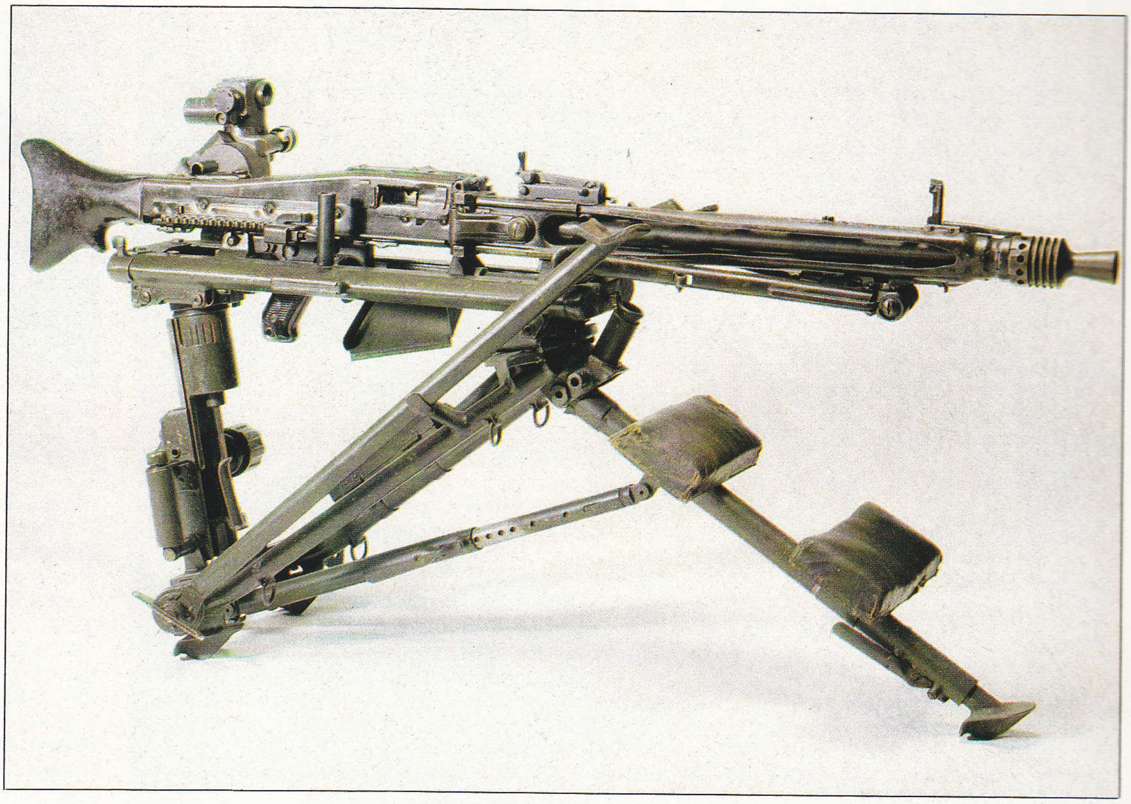
Maschinengewehr 42 general-purpose machine-gun

Despite the overall excellence of the MG 34 it was really too good for its task in terms of cost and production requirements, so despite the establishment of a full production facility and constant demand, by 1940 the Mauser designers were looking for something simpler. With the production example of the 9-mm MP 40 sub-machine gun as an example in production simplicity and low cost, they decided to adopt new production methods using as few expensive machining processes as possible allied with new operating mechanisms. The new mechanisms came from a wide range of sources. Experience with the MG 34 had indicated how the feed could be revised, and designs captured when Poland was overrun appeared to promise a new and radical breech locking system. Other ideas came from Czechoslovakia, and the Mauser team also introduced its own ideas. From this wealth of innovation came a new design, the **MG 39/41**, and from a series of trials carried out with this design came the **Maschinengewehr 42** or **MG 42**, a design that must rank among the finest of its kind.

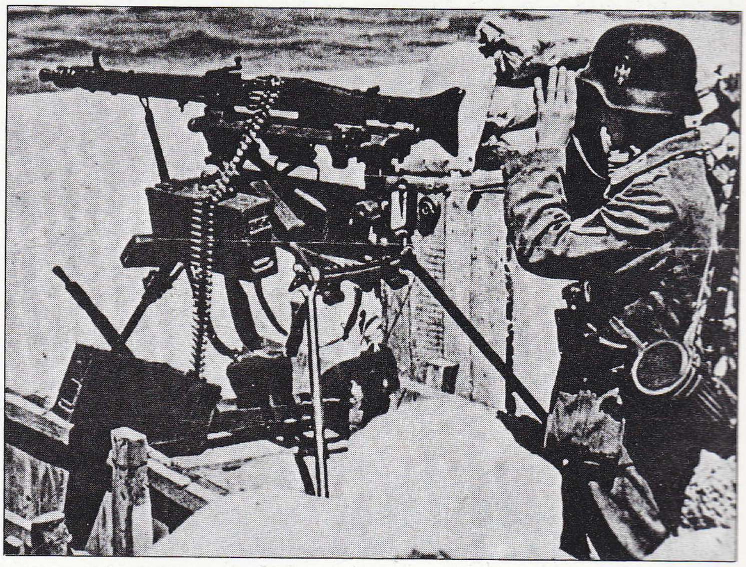
The MG 42 introduced mass-production techniques to the machine-gun on a large scale. Earlier designs had used some simple sheet metal stampings and production short-cuts (one example being the little-known French Darne light machine-gun), but the harsh environment that the machine-gun has to endure meant that few had any success. On the MG 42 that success was immediate. Sheet metal stampings were extensively used for the receiver and for the barrel housing which incorporated an ingenious barrel-change system. The latter was very necessary for the MG 42 had a prodigious rate of fire that sounded like tearing linoleum. This was produced by the locking mechanism employed, a mechanism that was developed from several sources and was both simple and reliable. The system involved the use of two locking rollers running up and down an internal ramp: in the forward position they locked the breech very effectively by mechanical advantage and then allowed the ramp to release the locking. On the ammunition feed an arm on the bolt was used to pull the ammunition belts across into the receiver in a simple and very effective fashion. Only the 50-round belt was used with the MG 42.

These design details merged to form a very effective general-purpose machine-gun and as is related elsewhere the type was attached to a wide range of mounts and other accessories. The MG 42's operational debut came in 1942, when it appeared in both the USSR and North Africa. Thereafter it was used on every front and in general issue was made to front-line troops only, for though the MG 42 was intended to supplant the MG 34 it in fact only supplemented the earlier type.

Not content with producing one of the finest machine-gun designs ever produced, the Mauser design team tried to go one better and came up with the **MG 45** with an even higher rate of fire. The end of the war put paid to that design for the time being, but the MG 42 lives on with many armies.



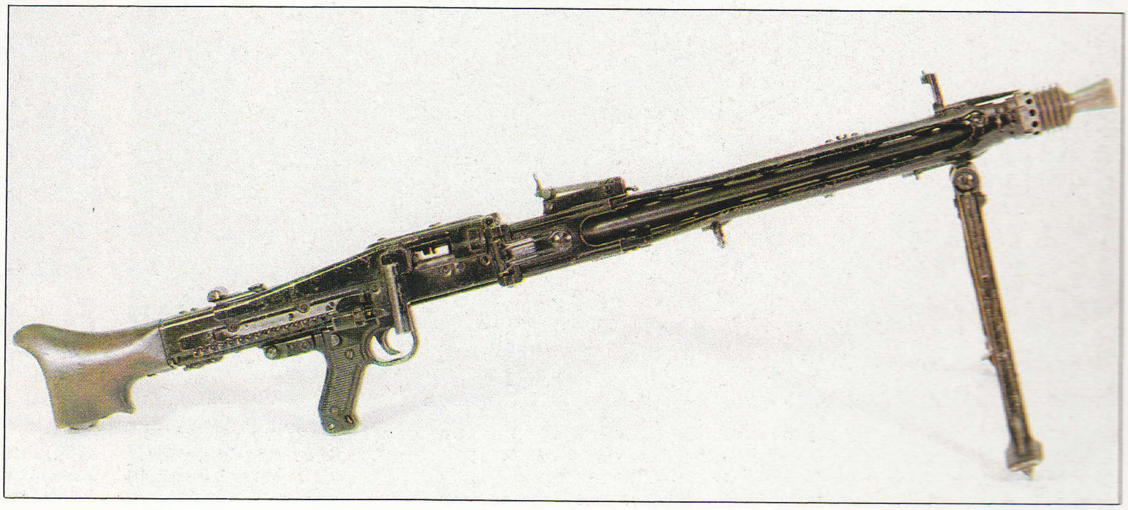
Above: An MG 42 mounted on the Lafette 42 for the heavy machine-gun role; this heavy tripod could be quickly adapted for the anti-aircraft fire role.



Right: MG 42 awaiting invasion as part of a fortified position on the Atlantic Wall, complete with ammunition belt loaded and spare barrel at the ready by the ammunition case.

Specification

MG 42
Calibre: 7.92 mm (0.31 in)
Length: 1220 mm (48.03 in)
Length of barrel: 533 mm (20.98 in)
Weight: 11.5 kg (25.4 lb) with bipod
Muzzle velocity: 755 m (2,475 ft) per second
Rate of fire, cyclic: up to 1,550 rpm
Feed: 50-round belt



An MG 42 for use in the light machine-gun role, with a bipod.

The MG 42 in Action

Produced out of the need to simplify the manufacture of the MG 34, the MG 42 was soon to become a weapon respected and feared by anyone who faced it. When the time came for West Germany to re-arm, the MG 42 was the natural machine-gun choice, and the weapon is in use in modernized form to this day.

American troops firing a captured MG 42; the Americans were so impressed by the MG 42 that they tried to produce a copy, which was a failure.

The MG 42 had its origins in the fact that the existing MG 34 was too expensive to manufacture and too costly in materials and time for extensive war-time production. While the MG 34 was an excellent weapon the ever-expanding German forces and the increasing amounts of territory they had to cover after 1940 meant that new machine-guns were constantly in great demand at rates that German industry could not meet. From this situation the MG 42 emerged.

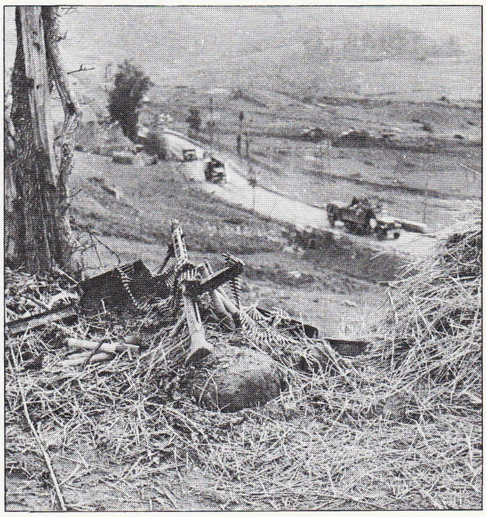
The MG 42 had its origins in 1937, when a project to produce a new and cheap form of machine-gun was initiated by the German Army weapons department, the *Heereswaffenamt*, which wanted a relatively cheap machine-gun that would be reliable under all conditions and one that could use the accessories and ammunition feed systems of the existing MG 34. In general the expensive close tolerances of the MG 34 were to be avoided to ease manufacture and assist operations in the field. From this requirement came one design with a novel breech-locking system that offered much, but none of these early submissions appeared to warrant further development. It was not until 1940 that the real impetus came and by that time the Mauser design team had been able to examine some Czech and Polish 'paper' designs of considerable promise. By that time the principle of using mass-production techniques for weapon manufacture was fully accepted and in employment for several types of small arm, including the revolutionary MP 38 and MP 40 sub-machine guns.

A trials weapon, known as the MG 39/41, was produced in 1941 using a new locking device that had small steel rollers set into the sides of a breech block. As the breech block was pushed into the locking position by a spring the rollers were pushed outwards into grooves in the receiver walls where they formed a mechanical advantage for the critical instant of firing. The system operated smoothly and reliably, and had the advantage of a high operating speed providing a high rate of fire (almost double that of existing machine-gun designs). The overall system was of the recoil type aided by a muzzle device to trap the muzzle gas pressures.

With some slight alterations to this system the type was soon in production as the MG 42. Quick introduction onto the production lines was aided by the intended fact that many existing machine tools could be easily adapted to the task and that the need for special machine tools was kept to a minimum. Great use was made of simple steel pressings, and welds were employed where pins and screws would normally have been employed. For all this ease of manufacture the MG 42 worked even better than the MG 34 and had a very high rate of fire. This was about 1,500 rpm, and the accompanying noise was not dissimilar to that of a band saw. Thus small-capacity magazines, although they could be fitted, were of limited use and reliance was generally placed on 50-round belts that could be linked together for prolonged fire. Such prolonged fire and the high fire rate made necessary some form of barrel-change mechanism, and the system used was very simple and rapid: as the lever on the side of the barrel jacket was pulled outwards a rotary device turned the barrel to release the locking lug, at the same time freeing it to be pulled out readily to the rear.

The MG 42 followed the MG 34 in that it was designed as a general-purpose machine-gun. For infantry use a simple bipod was fitted, but in the heavier roles some very complex devices were introduced. The basic tripod turned out to be a special one for the MG 42 alone and a great chance was missed to enable many of the MG 34 accessories to be used with the new design despite the earlier intentions. In fact almost every accessory produced was for the MG 42 alone and only a few of the existing MG 34 items proved to be usable with the later weapon. Some of the MG 42 mountings turned out to be very complex affairs, especially the very expensive ball mountings produced for use in fortifications and other similar ball mountings produced for mounting in the front hulls of heavy tanks such as the Tiger and the Panther. Rather less expensive but no less complex were the various *Zwillingslafetten* (twin mountings) produced for anti-aircraft defence and often carried on small towed hand carts.

The MG 42 was in service by the end of 1942 both in North Africa and the Soviet Union. It soon proved to be a formidable weapon and was feared by all who encountered it. Some Allied troops tried to capture as many as possi-



Above: An abandoned MG 42 in an excellent infantry position overlooking a road in Italy. Note the Stielgranate *(stick grenades) lying ready for use.*

Left: Luftwaffe Fallschirmjäger *(parachute troops) defending the ruins of the Cassino monastery with an MG 42 in April 1944.*

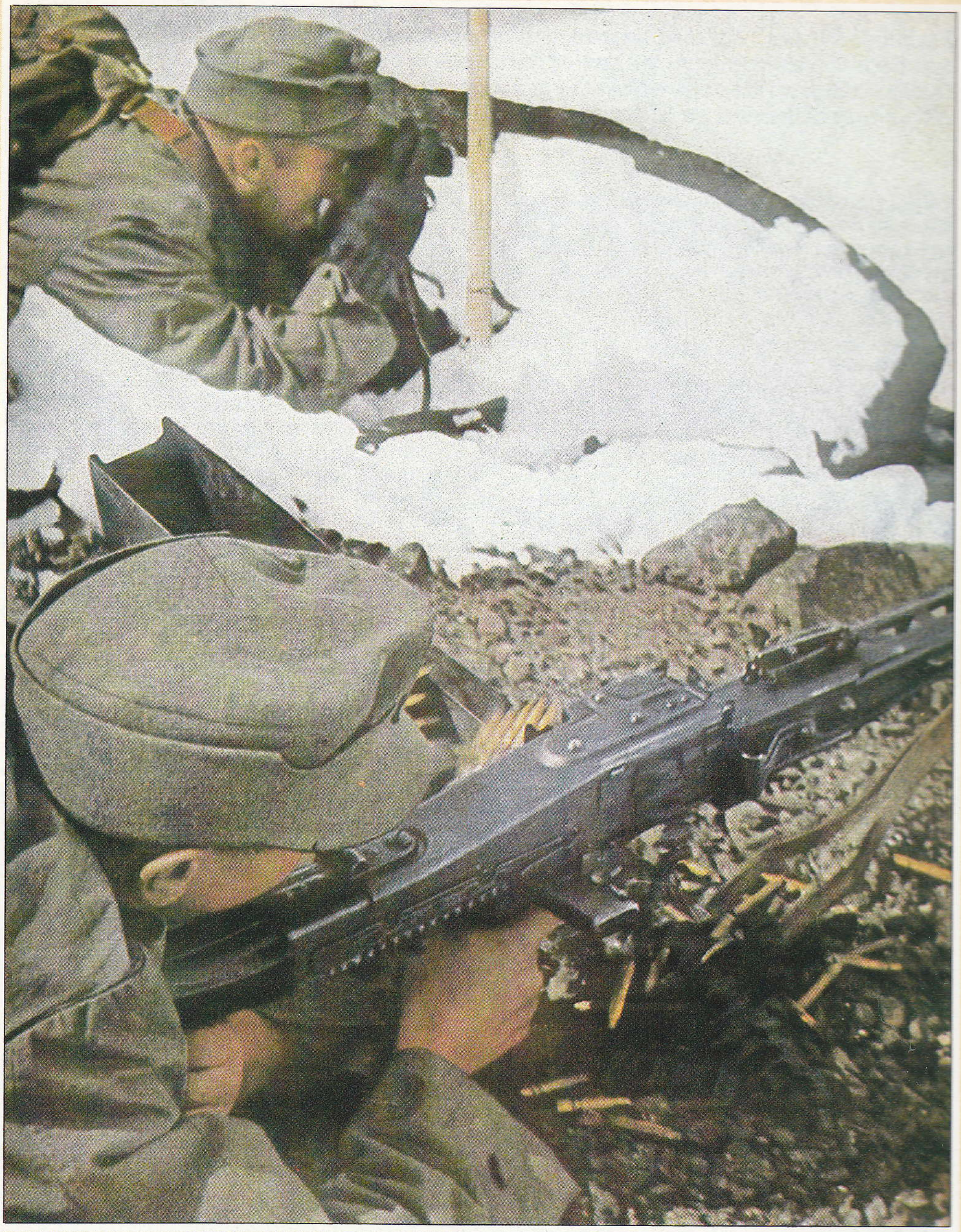
ble for their own use, surely one of the best accolades for any weapon design, and the US Army examined the design (and built prototypes in 7.62-mm/0.3-in calibre) for possible future adoption. Until 1945 the MG 42 was usually reserved for front-line units only, the MG 34 being gradually switched to rear support echelons; but the MG 42 had not fully replaced the MG 34 before 1945.

After 1945 large numbers of MG 42s were issued to several European armies, including the French army which used the MG 42 during their Indo-China campaigns. One nation took over large numbers of captured MG 42s and completely re-equipped its front-line army units. That nation was Yugoslavia, and so impressed was it with the MG 42 that it even established a national production line. The Yugoslavs even retained the 7.92-mm (0.31-in) calibre, and to this day maintain the type in production for possible export sales. They know the MG 42 as the M53 and their product is exactly the same as the original MG 42, right down to accessories such as the tripod.

Germany re-arms

By 1957 the Federal Republic of Germany was established as a full member of NATO and some thought was given to the rearming of the West German forces. When it came to machine guns the MG 42 was the immediate choice, but as Mauser (being in East Germany) was no longer on the side of the NATO allies the production base was switched to Rheinmetall GmbH. Using an actual example as a starting point, Rheinmetall restarted production once again in 1959, but this time in the standard NATO calibre of 7.62 mm (0.3 in). The product was known at first as the MG 42/59, but in time this was changed to MG 1 to aid the export image. There are several sub-variants of the MG 1, including one in which the butt can be removed to aid anti-aircraft use from vehicle ring mountings. When sufficient old war stocks of MG 42s were released from warehouses they too were converted to the NATO 7.62-mm (0.3-in) calibre and these became the MG 2. Then came the MG 3 with a number of minor Rheinmetall-inspired improvements including a version with several light alloy components to reduce weight. Even this fully modernized variant is immediately recognizable as an MG 42.

Today the West German Bundeswehr continues to use the MG 1 and MG 3 in exactly the same manner as its predecessor used the MG 42. It is still employed either mounted on its own bipod or mounted on a heavier tripod for the sustained-fire role. Leopard tanks mount MG 3s where Panthers once mounted MG 42s, and a number of new types of vehicle mounting have been designed and produced. On the infantry side the MG 3 is still used on occasion in the anti-aircraft manner when emergency targets appear. One man of the squad acts as a temporary firing stand while another aims and fires, using his partner's back as a stand for the gun. Infantry squad tactics remain much the same, in that a section of up to eight infantrymen depends on its section MG 3 for the bulk of its own supporting firepower. The squad moves only under covering fire from the MG 3, and once emplaced the section then supplies the machine-gun team with covering fire as it moves forward. The section also carries the bulk of the machine-gun's ammunition either hand-carried in boxes or in belts slung about their persons.



German Gebirgsjäger *(mountain troops) with an MG 42 in use in the light machine-gun role; note the stamped receiver and components, which made the gun easier to manufacture.*

In defence the MG 3 is usually mounted on a heavy tripod, carefully emplaced to provide a good field of fire. At night the machine-gun is emplaced to provide fire along special fixed lines of approach, and for this (and for indirect fire) the machine-gunners use a special indirect foresight very similar to that used on light mortars. Mechanized infantry often mount their machine-guns on top of the vehicle in the same manner as that employed on World War II half-tracks, but these days more often than not the MG 3 is protected by some form of turret cover. For anti-aircraft defence the *Zwillingslafette* has been revived.

Today the MG 1 (or MG 3) is in licence production in several locations in such countries as Italy, Spain, Turkey, Portugal and Pakistan. Every year it appears that more nations adopt the type and the market is still far from sated. It seems that the basic MG 42 design will still be in widespread service after the turn of the century. The reasons for this are not difficult to discover. The MG 42 and its later derivatives are easy to manufacture, to maintain, to clean and to use in action, and have been developed to the point where no bugs remain. Add to this the ready availability of numerous accessories to suit almost any application and the ability to obtain spares from a number of easily-accessible sources, and the popularity of the type becomes clear. But these alone are not the full answer. That must lie somewhere in the overall appearance and feel of the weapon. The MG 42 and its descendants all have that look of a thoroughbred design that can be relied upon. Many other weapon designs quite simply do not have this asset, but the military mind is not so simple as to rely on appearances alone. The military mind wants quality that can be relied upon under all circumstances, and the MG 42 series can provide that quality.

The Battle of Stalingrad

Stalingrad was one of the few true turning points in history. Fought over with unimaginable ferocity, at the cost of hundreds of thousands of German and Russian lives, Stalingrad was more than the graveyard of the German 6th Army. It was the beginning of the end for Hitler and for the war in the East.

When Hitler gave the orders that led to the Battle of Stalingrad in late 1942 he could still have won the war. When the Battle of Stalingrad was over he could no longer win anything more than purely local initiatives. Stalingrad consumed the German 6th Army and in the process the Red Army turned the tide of the war: until Stalingrad the Germans were always on the offensive; after Stalingrad they were continually falling back, making only localized attacks with little overall impact.

In August 1942 the German army was deep inside the borders of the Soviet Union. Everywhere the German armoured units had been able to strike deep into the Red Army formations, taking huge numbers of prisoners and stockpiles of equipment. But all the time the front-line soldiers were aware they were being dragged onwards into the huge Soviet hinterland that could absorb men and units with ease. On the southern end of the front this was particularly obvious as the Germans advanced over the River Don into the vast plains of the Ukraine. Ahead lay the Volga and the prize of Stalingrad, a prize of both military and political importance which the Germans wanted and the Red Army was determined to keep.

A German advance on the city started on 21 August. To the north of Stalingrad the German XIV Panzer Corps (6th Army) advanced through the hapless Soviet 62nd Army almost to the northern gates of the city. From the south the 4th Panzer Army under the command of General Hoth made advances just as massive through the 64th and 51st Armies, and by the end of August Hoth's forces were almost within sight of the city. And from the west XXIV Panzer Corps (6th Army) advanced east up the Karpovka river.

From then onwards the advances slowed. The Germans reached the built-up outskirts of the city and almost at once the Red army defences stiffened. Street fighting replaced the huge armoured sweeps of the previous months. While German units attempted to force their way towards the River Volga they discovered that their armoured units were of little use other than as battering rams to destroy buildings. Red Army units defended every approach, and tanks attempting to force their way along streets or through narrow defiles were picked off by hidden tank-killer squads. As the infantry advanced on foot they found every road and open space swept by machine-gun fire. The only way forward was house-to-house fighting, usully through the walls with small squads battering their way with grenades, light machine-guns and explosives.

As the German moved forward, yard by yard, their casualties mounted almost by the hour. More fresh units were fed into the fighting, and then more, and after them more still. Gradually the Germans came to appreciate that the street fighting that gradually inched its way towards the Volga was costing them the best of their available men and equipment. From the Red Army point of view things were no better. They were being hammered by the Luftwaffe, assaulted on all sides on the western bank of the river but were constantly being told to stand where they were and yield nothing. This cost the Red Army just as many men as it cost the Germans, but to the Soviet Union Stalingrad assumed an almost mystical importance as being an expression of the will of the Soviet way of life as opposed to that of the German. For the Germans the battle came to have just as much an importance as it absorbed more and more of their military potential. As the street fighting went on during September, October and November the battle came to represent a battle of ideals and national fervour.

By the beginning of November the Germans were almost at their goal: to the north and south of the city they were already on the Volga, but the centre of the city with its huge office, housing and factory blocks still held out. Every night the Red Army was able to ferry men and supplies across the Volga but things were getting desperate. Water became just as important to the Red Army units holding out in cellars and in grain silos as did the ammunition for the machine-guns that kept the Germans at bay.

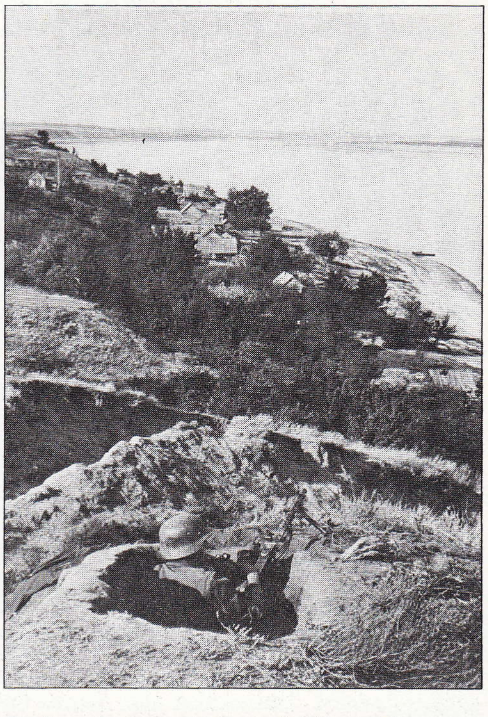
The tables are turned

As the Red Army held out the Germans poured in men from the 6th Army and 4th Panzer Army to the extent that they neglected the flanks, which were held by reserve units and such dubious allies as the Romanians, who were poorly equipped and had little stomach for the campaign. They were also aware that the Red Army was building up units to the north and south of the city, but while they noticed divisions to their front the reality was that whole armies were actually waiting to pounce. Pounce they did on 18 November. Following a massive artillery barrage the 1st Guards, 5th Tank and 21st Armies attacked the north and the 51st, 57th and 64th Armies in the south. Within three days the German 6th Army and part of the 4th Panzer Army were trapped inside a cordon that they could not break.

It was now the turn of the Germans to become the besieged. Gradually they had to fall back within the ruined perimeters of Stalingrad as Red Army formations closed in around them. Attempts by desperate German army task forces were all turned back with almost con-

An MG 34 post; note the empty ammunition boxes piled behind the lonely slit trench, a sign of heavy fighting in static positions.

An MG 34 being used from its heavy tripod to clear Soviet snipers from the roof of the factory seen in the background.

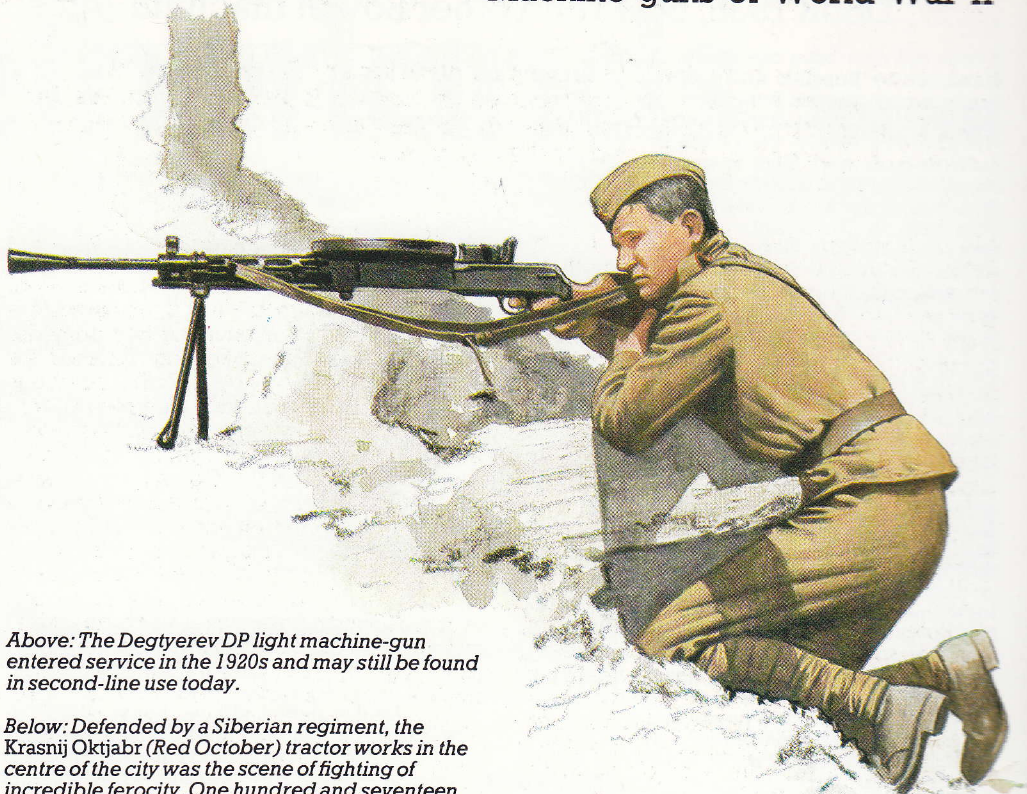


Far from the house-to-house fighting, a German sentry keeps watch from an MG 34 position overlooking the banks of the Volga.

temptuous ease, for the best of the German units on the southern front were trapped inside the Red Army noose.

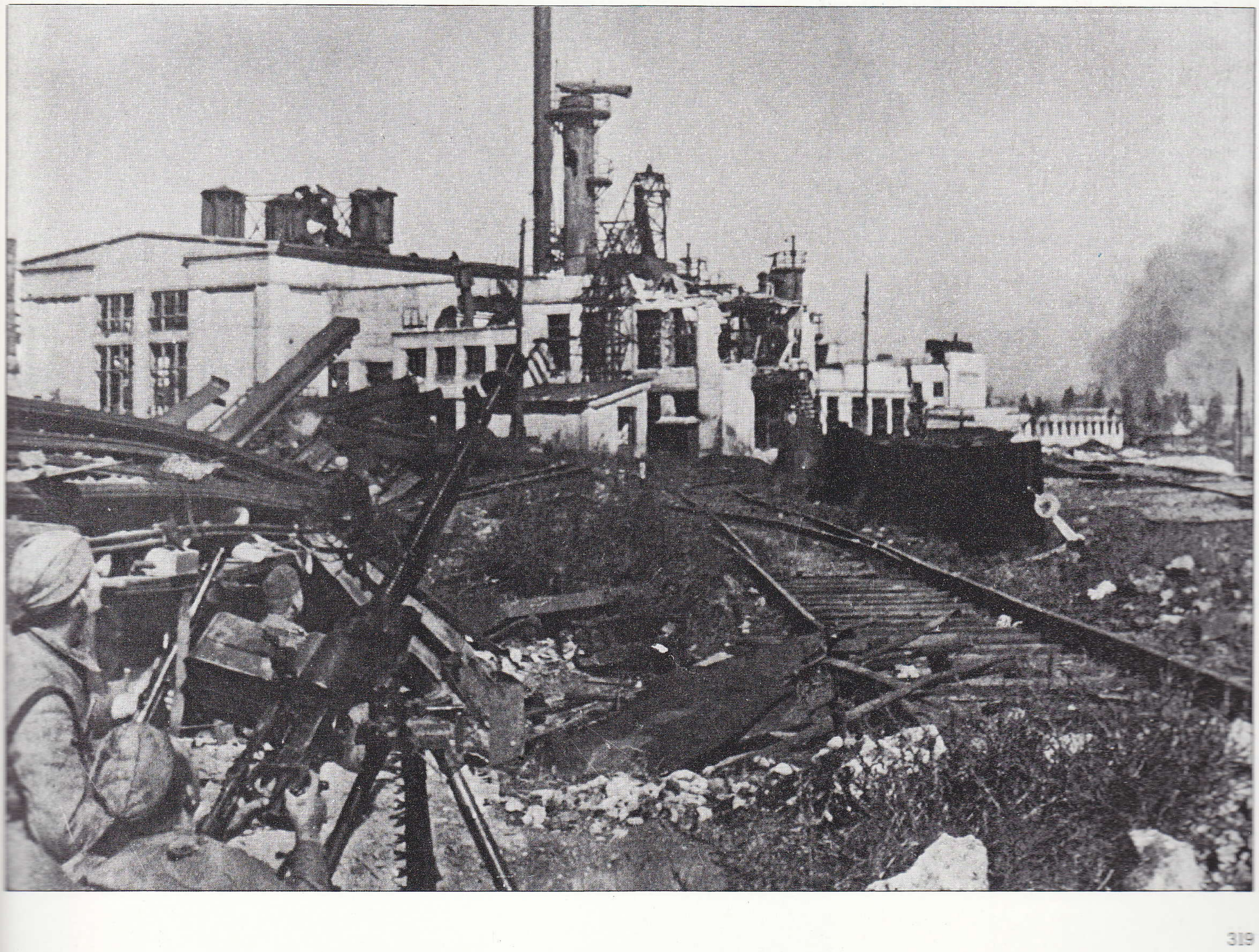
The men of the 6th Army fought on as the days dragged by, but they were forced back into the wrecked city just as relentlessly as they had forced back the Soviets a few months earlier. Attempts to supply them by air failed as there was insufficient airlift capacity available. Pleas from the 6th Army commander, General Paulus, for permission to break out were rejected by Hitler. The unfortunate German soldiers had to continue the fight, and the house-to-house fighting from miniature strongpoint to defended cellar increased in bitterness. Exhausted men, too tired to provide for themselves or their weapons, still fought on with increasing desperation, but the end was in sight. By the end of January one of the two pockets into which the 6th Army had been divided surrendered. The other pocket followed two days later.

The loss to the German army was immense. It could never hope to replace the men or the equipment lost but, more important by far, it had lost the strategic initiative: after Stalingrad it was the Red Army that called the tune. And in the sky the Red air force had also overcome the Luftwaffe. For the moment the German commanders salvaged what they could from the wreckage, and the Red Army commanders prepared the campaigns that were to lead to the fall of Berlin.



Above: The Degtyerev DP light machine-gun entered service in the 1920s and may still be found in second-line use today.

Below: Defended by a Siberian regiment, the Krasnij Oktjabr *(Red October) tractor works in the centre of the city was the scene of fighting of incredible ferocity. One hundred and seventeen separate attacks were launched (including 23 in one day) before the end of October.*



USSR

DShK 1938, SG43 and other Soviet machine-guns

If there has ever been one factor differentiating Russian and Soviet machine-gun designs from those of other nations it was the simple factor of weight. For many years these machine-guns were built to such a standard of robustness that weight alone was used as a means of incorporating strength, the ultimate example being the old M1910 Maxim guns that almost resembled small artillery pieces with their wheeled and shielded carriages. Eventually this avoidable trait was recognized by the Red Army when mobility made its way into long-term planning and by the mid-1930s, when a new heavy machine-gun was required, emphasis being placed more on design than sheer mass for strength.

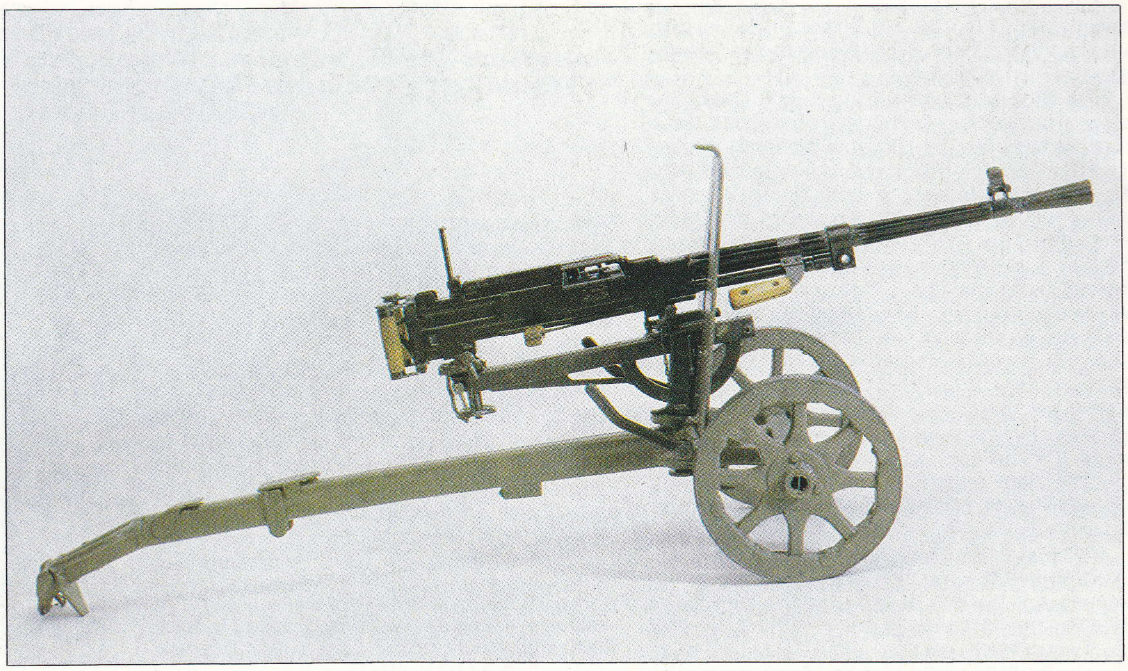
The new heavy machine-gun was intended to be in the same class as the 12.7-mm (0.5-in) Browning, but the Soviet equivalent turned out to be slightly lighter. It used a 12.7-mm (0.5-in) cartridge and was intended for a variety of roles. To the credit of the new design, the **DShK1938** (in full the *Krasnoi Pulemet Degtyereva-Shpagina obrazets 1938g*), has proved to be almost as successful as the Browning, for it is still in production, albeit in a post-war modified form as the **DShK1938/46**, and is still in widespread service.

If the DShK1938 was lighter as a gun than the Browning the same could not be said of the mount, for as an infantry gun the DshK1938 retained the old wheeled carriage of the M1910, but a special anti-aircraft tripod was introduced and is still in use. The type became a virtual fixture on most Soviet tanks from the JS-2 heavy tanks onwards, and the Czechs have produced a quadruple mounting with DShK1938s for anti-aircraft use. There was even a special version for use on armoured trains.

The smaller **SG43** was introduced during 1943 to replace earlier 7.62-mm (0.3-in) machine-guns, including the venerable M1910. During the initial phases of the German invasion of the USSR the Soviet forces lost huge amounts of material, including machine-guns, and if their new production facilities were to replace these losses they might as well be modern designs. Thus the *Stankovii Pulemet Goryunova obrazets 1943g* came into being. It was a gas-operated and air-cooled design that combined several operating principles (including the well-established Browning principles), but overall the design was original and soon proved to be sound. As the SG43 the design was issued in very large numbers and even today the basic weapon is still in widespread use, albeit in a much modified and upgraded form as the **SGM.**

Both the SG43 and the larger DShK1938 have the same basic operational simplicity. Working parts have been kept to a minimum and very little routine maintenance apart from simple cleaning is required. Both designs can operate under extremes of temperature and they are most forgiving of dirt and dust in the works. In other words both suit exactly the type of environment in which they will be used.

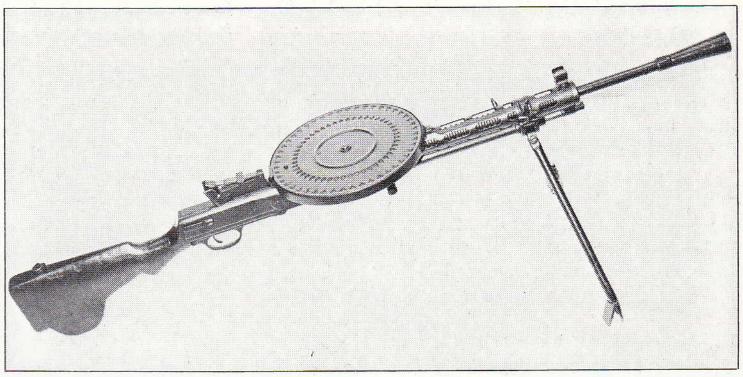
Right: Similar in performance to the 12.7-mm (0.5-in) Browning, the DShK 38/46 is still in production and service.



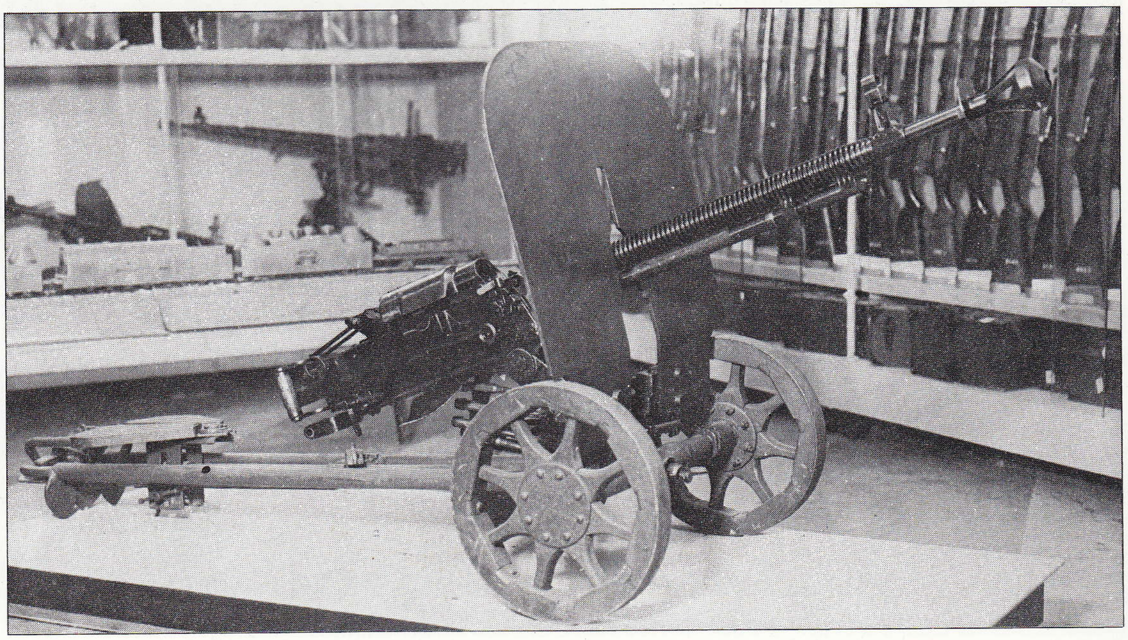
The SG 43 was designed by P.M. Goryunov in 1942 to provide a wartime replacement for the elderly Maxim Model 1910, and even used the old Maxim's wheeled carriage.

Specification
DShK1938
Calibre: 12.7 mm (0.5 in)
Length: 1602 mm (63.1 in)
Length of barrel: 1002 mm (39.45 in)
Weight: 33.3 kg (73.5 lb)
Muzzle velocity: 843 m (2,765 ft) per second
Rate of fire, cyclic: 550-600 rpm
Feed: 50-round metal-link belt (five belts joined)

Specification
SG 43
Calibre: 7.62 mm (0.3 in)
Length: 1120 mm (44.1 in)
Length of barrel: 719 mm (28.3 in)
Weight: 13.8 kg (30.4 lb)
Muzzle velocity: 863 m (2,830 ft) per second
Rate of fire, cyclic: 500-640 rpm
Feed: 50-round metal-link belt



Above: The Degtyerev DP Model 1928 was a major Soviet light machine-gun during World War II. Simple and robust, the DP could stand rough treatment and extremes of weather. It can still be found in the hands of guerrilla groups all over the world.



The Netherlands

Providing the heavyweight punch of Netherlands artillery are 24 M110 203-mm SP howitzers. These are being replaced in service by the longer-barrelled M110 A2, and more are being acquired.

The armed forces of The Netherlands are assigned primarily to NATO, and as such are basically conscripted so far as the army is concerned, each force having a core of regular personnel (proportionally larger than that of the army in the navy and air force). The total strength of the Dutch armed forces at any one time is about 104,000 including 50,200 conscripts, who serve for periods ranging between 14 and 17 months depending on the branch of the services to which they are allocated.

Dutch Army

For a small army (67,000 including 43,250 conscripts, and supported by 145,000 reservists), the Dutch use a wide variety of weapon types. The bulk of the army is assigned to NATO's Northag (Northern Army Group), but is based mainly in The Netherlands. The core of the Dutch army comprises one battalion with six Lance surface-to-surface battlefield missiles; two armoured brigades operating a mix of 468 Leopard 1 and 343 Centurion main battle tanks with 126 AMX-13 light tanks for reconnaissance; and four mechanized infantry brigades using 745 M113, 742 YP-408 and 1,051 YP-765 armoured personnel carriers supported by 66 AMX-VCI mechanized infantry combat vehicles. The infantry uses standard NATO small arms of 7.62-mm (0.3-in) calibre, including the FN FAL rifle, the Heckler and Koch G-3 rifle and the FN MAG general-purpose machine-gun. Other primary weapons are the 9-mm Uzi sub-machine-gun and the 12.7-mm (0.5-in) Browning M2HB heavy machine-gun, and extra firepower is offered to the infantry in the form of mortars (US M1 81-mm, 194 US M20 107-mm/4.2-in and 153 Hotchkiss-Brandt 120-mm weapons), anti-tank weapons (Raufoss 66-mm rocket-launcher, FFV Carl Gustav 84-mm launcher, M40 106-mm recoilless rifle, and missiles in the form of 350 Dragon and TOW weapons) and anti-aircraft weapons such as the M55 towed mounting with four Browning heavy machine-guns. This last is to be replaced by 464 FIM-92 Stinger man-portable surface-to-air missiles currently on order.

The main strength of the artillery arm is made up of self-propelled pieces of American origins, notably 136 M109 155-mm, 12 M107 175-mm and 24 M110 203-mm weapons, backed by towed weapons such as 44 105-mm, 140 155-mm and 28 203-mm equipments. Air defence is provided by 131 Bofors 40-mm L/70 guns and 95 Gepard 35-mm radar-controlled self-propelled anti-aircraft systems. Much of the Dutch armed forces' support equipment (trucks and armoured personnel carriers) is provided by indigenous industry. Currently a modernization programme is being undertaken, the two most important orders being for 445 Leopard 2 main battle tanks, and an additional 37 M110A2 203-mm self-propelled howitzers. There are also three helicopter squadrons under army control, though these are operated by air force personnel. Equipment for these squadrons is 72 Aérospatiale Alouette III and 28 MBB BO 105 helicopters. Finally, it is worth noting that a proportion of army conscripts is trained in special civil emergency formations to act as mobile water supply and repair columns.

Dutch Air Force

The Royal Netherlands air force is a component of the 2nd Allied Tactical Air Force, and is divided into two main commands, namely Tactical Air Command and Logistic and Training Command. Strength is about 19,000 personnel, including 4,600 conscripts, and 172 combat aircraft; manpower reserves amount to about 6,000.

Currently replacing the F-104G Starfighter-equipped combat units of Royal Netherlands air force Tactical Air Command, the General Dynamics F-16 Fighting Falcon is also scheduled to succeed the Northrop NF-5 between 1985 and 1989.

Tactical Air Command is the major operational command, and has largely completed the process of converting from the Lockheed F-104G Starfighter to the General Dynamics F-16 Fighting Falcon as its main aircraft for the strike and reconnaissance roles. The two main bases are at Leeuwarden and Volkel, each accommodating a wing of three squadrons (one reconnaissance and two strike). In August 1983 the Dutch air force's Starfighter strength had declined to 36 F-104Gs and 18 RF-104Gs, while that of the Fighting Falcon had increased to 98 F-16As and 26 F-16Bs. Also in service are some 72 Northrop NF-5s: 54 of these are NF-5As on the strength of three fighter/ground-attack squadrons, and the other 18 are NF-5B two-seaters used by an operational conversion unit. The NF-5s are scheduled for replacement by Fighting Falcons in the period between 1985 and 1989, an extra 82 F-16s having been ordered to supplement the 124 delivered or on order by 1980.

Transport and other roles are the responsibility of the Logistic and Training Command, whose main fixed-wing assets are 12 Fokker F.27M Friendship Mk 100 logistic transports. The Dutch air force has no pure training aircraft, aircrew travelling to Canada for initial training on Beech CT-134A Musketeer IIs, Canadair CT-114A Tutors and Canadair CF-5Bs, or to the USA for training on Cessna T-37Cs and Northrop T-38A Talons. Pilots then return to The Netherlands for operational conversion on two-seat versions of combat types. Other Dutch air force units are one search-and-rescue flight with four Aérospatiale Alouette III helicopters, and 15 surface-to-air missile squadrons. Of these latter, four are equipped with 16 Nike Hercules missiles, and the other 11 with 66 Improved HAWK missiles. Eight of the Improved HAWK squadrons are based in West Germany. Defence of Dutch air bases is entrusted to 25 radar-controlled Flycatcher systems with 40-mm Bofors L/70 guns. Other than Leeuwarden and Volkel, the main bases are Deelen, Eindhoven, Gilze Rijen, Soesterberg and Twenthe.

To be continued